SIERRA LEONE.

IMI... MYCOLOGY

Annual Report

OF THE

LANDS AND FORESTS DEPARTMENT

FOR THE YEAR

1928.

FREETOWN:
Printed at the Government Printing Office
SIERRA LEONE
1929

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FROM THE DIRECTOR OF AGRICULTURE

TO THE HONOURABLE THE COLONIAL SECRETARY, FREETOWN.

SIR,

I have the honour to submit the annual report of the Lands and Forests Department for the year 1928.

STAFF.

2. I refer you to the reports of the various divisions for the staffs under each division therefore I shall only deal briefly with that of the headquarter office in Freetown.

Mr. M. T. Dawe, O.B.E., Commissioner of Lands and Forests, was on sick leave from 1st January to the 26th April, on which date owing to health reasons he accepted the post of Director of Agriculture, Cyprus. It was well known that Mr. Dawe's energy and enthusiasm were boundless and it was with great regret that the officers of this department heard of his transfer after nearly six years constructive work in this Colony and during which period the department was entirely reorganized.

Mr. K. G. Burbridge, Conservator of Forests, acted as Commissioner of Lands and Forests, from 1st January to 2nd October when he proceeded home on sick leave.

Mr. D. W. Scotland, Director of Agriculture, acted as Commissioner of Lands and Forests from 3rd October to the end of the year, and also held a substantive appointment of Director of Agriculture, removing his entire office from Njala (his headquarters since 1912) to Freetown.

VISIT OF BRIGADIER-GENERAL SIR SAMUEL WILSON, K.C.B., K.C.M.G., K.B.E.

3. During Sir Samuel Wilson's visit to Sierra Leone in October he visited the Experimental Farm at Njala and the Oil-palm Plantation at Masanki near Mabang.

VISIT OF PROFESSOR H. CLARK POWELL.

4. Through the courtesy and generosity of the Empire Marketing Board, the Government was indebted to Professor H. Clark Powell of Transvaal University College, Pretoria. for his invaluable help and advice on Citrus cultivation during his brief visit to Sierra Leone in December. Professor Clark Powell visited Njala and inspected the citrus variety plots there. After this he inspected the newly selected area near Newton for an experimental fruit farm.

EXPERIMENTAL FRUIT FARM, NEWTON.

5. Mr. M. T. Dawe, O.B.E., submitted a scheme for establishing two experimental fruit farms, one to be near Newton in the eastern section of the Colony, the other in the mountainous western section. The Empire Marketing Board was approached for funds to carry the scheme through. In the early part of the year Major Elliott made a brief call at Freetown on his way to Nigeria with the result that the Empire Marketing Board agreed to support a modified scheme of our Experimental Fruit Farm in the eastern section. An excellent site was selected about one mile south of Newton Railway Station. By the end of the year a motor-road was made from the farm site to the station and quarters for the Manager and Assistant Manager built. An area of approximately fifteen acres was planted with

Canary bananas. Owing to the difficulties in procuring a suitable Manager for the farm, no appointment was made during the year under review. Mr. E. MacDonald, Acting Conservator of Forests, acted as Manager and he is to be congratulated on the manner in which he got the work done on the farm, especially as he had the administration of the Forestry Division to carry out as well.

6. With the assistance of Professor H. Clark Powell, a detailed scheme of work was drawn up. It is proposed to carry out trials in connection with grape fruit and lemons in root and bud stock, cultural operations and manures. The bud wood for stocking Newton will be obtained from budded stock of known history and performance growing at the Experimental Farm, Njala. The root stock will be raised from seed of local varieties of citrus. A start has been made in raising root stock on the lines indicated by Professor H. Clark Powell.

Masanki Oil-palm Plantation near Mabang.

7. The department experienced difficulty in arranging for the European management of this plantation with the result that Forestry officers had to be called upon to take charge. Mr. D. G. Thomas, while Acting Conservator of Forests and in charge of the Northern Circle, took over the management of the Masanki Palm Plantation on the 8th January. He was, however, relieved of his duties as Conservator of Forests on the 22nd June. Mr. I. G. C. Squire was appointed Assistant Manager and arrived in the Colony on the 19th May. A European Overseer, Mr. W. F. Williams, was appointed in early June for supervising the construction of various roads and buildings.

8. In spite of the difficulties experienced with regard to staff, considerable development took place with regard to this scheme. Labourers lines were erected on approved plan, a concrete office and store built and temporary quarters for the Assistant Manager and European Overseer erected. All the main parts of the plantation were opened up by motorable roads and Mabang Station was connected to the plantation by road. In this manner the work could be carried out quickly and with greater efficiency. A private telephone line was also erected.

9. The germination of the seeds in the nurseries during the early part of the year was most disappointing. The Nigerian "A" and Henoi seeds gave a germination of 3·8 per cent. and the Deli seed from Sumatra only 3 per cent. Consequently it was not possible to plant up the area originally intended to be planted in 1928.

10. *Block I, Henoi.*—Beating up of failures was carried out in the 300 acres prveiously planted but no new planting was done in this block.

Block II. Nigerian "A."—Plots 5, 7 and part of 10 were planted up. Plot 5 looks well, but there are many failures in the other two plots because the seedlings planted on these plots did not stand the journey well from Njala.

11. During the year under review rats were very destructive amongst the young palms in the plantation. Active measures were taken to deal with the situation. I am glad to report that at present the loss of palms is not so serious. The pest is, however, engaging the serious attention of the management.

12. Before the end of the year the nursery method was reorganized and supplies of seed of Nigerian "A," Nigerian "B" and Henoi sown. After twelve weeks the germination results were most encouraging, especially in the Nigerian "B" beds. If the germination proceeds at the present rate the 2,000 acres should easily be planted by 1931.

13. The Acting Manager, Mr. D. G. Thomas, was granted permission to spend his local leave on a visit to Nigeria and the Cameroons to study the work done on oil-palms in these areas. Mr. Thomas was away from the Colony from the 14th November until the 31st December. During his journey he covered a wide field and has submitted an interesting report.

Imperial Institute, London.

14. The department again had valuable assistance and advice from the above Institute and information was supplied to the Director of the Imperial Institute on various subjects. We are also very grateful to the staff for their valuable assistance and advice in connection with the Sierra Leone exhibit at the British Industries Fair, London.

The Royal Botanical Gardens, Kew.

15. I wish to thank the Director and his staff at Kew for their assistance and advice on various subjects and for the trouble taken in identifying specimens, etc., submitted by my officers.

Imperial Bureau of Mycology.

16. The above Bureau has been most helpful in advising the Mycologist and a number of specimens submitted by this officer has been identified. We are grateful for this help.

Imperial Bureau of Entomology.

17. Full use of the above Bureau was made by the Entomologist. Numerous specimens were collected and forwarded to the Bureau for identification. We are grateful for their valuable help and co-operation.

British Cotton Growing Association.

18. I wish to record my grateful thanks to Sir William H. Himbury, Managing Director of the above Association, and its expert brokers, Messrs. Wolstenholme and Holland, for their reports and valuations on the many samples of Quande cotton forwarded to them. In many cases these samples were very small, but in spite of this full reports were sent to us. For further information on this variety of local cotton see the Agricultural Instructor's report.

Exhibitions and Fair.

19. Sierra Leone again took part in the British Industries Fair, London. Mr M. T. Dawe, O.B.E., was in charge of our stall. The various raw products of the Colony were exhibited together with basket work, leather work and country cloths. Especial interest was shown in raffia fibre and piassava owing to the increased demands for these fibres.

20. During 1928 Nigeria, the Gold Coast and Sierra Leone put up a joint exhibit at the Canadian National Exhibition at Toronto. This resulted in a large and attractive exhibit. All the major products of this Colony were on show. Mr. P. Clemens represented Sierra Leone. A considerable amount of interest was shown in the West African Section.

21. The exhibits for the above Exhibition and Fair were prepared by my department and a considerable amount of time of my staff was taken up with this work.

Chemical Section.

22. The report of the Agricultural Chemist is attached as Part II of this report. The main work of this section has been the continuance of the important soil survey and research of the country. Important and interesting data on laterite and laterisation is being collected. As the soils are largely lateritic, investigation is of vital importance to us. The chemical investigations in connection with oil-palm products were also continued. The files of this section now contain a large amount of important data and information on oil-palm research, not only relating to Sierra Leone, but other countries where this important crop is being dealt with.

Mycological Section.

23. The Mycologist's report is submitted as Part III of this report. The report is full of interest. There is no doubt that Mr. Deighton has covered a very large field in his investigations and added considerably to our knowledge. The work was facilitated by the fact that the Mycologist had a fairly well equipped laboratory for the first time. Some of the more serious diseases identified are Pink disease of cocoa, Mosaic disease of cassada, Leaf Spot of yams and *Sclerotium rolfsii sacc.*, a troublesome fungus in gardens.

24. Mr. Deighton added considerably to our knowledge of the flora of Sierra Leone. Over 500 specimens of flowering plants were collected and added to the Herbarium.

25. Mr. Deighton was also in charge of the oil-palm plots at Njala. He has collected considerable data and information with regard to the varieties under trial and he compiled a valuable memorandum on our work to date. The eight-year old Nigerian oil-palm shows a further increase in yield. This work at Njala is being very carefully watched.

Entomological Section.

26. The lines of investigation carried out by Mr. E. Hargreaves are submitted as Part IV of this report. Valuable results have been attained. I particularly wish to mention his success in at last locating the egg masses of the locust (*Zonocerus variegatus L*). This is one of our most serious pests during the dry season and I congratulate Mr. Hargreaves on his patient investigations resulting in finally working out the habitat and life history of this locust. Egg masses can now be located and destroyed in thousands and a very successful poison bait effectively deals with the adults. As this locust is non-migratory and localized it is hoped that in time organized campaigns will control this pest.

Further important work has been carried out on citrus and kola pests and if the Entomologist's instructtons for dealing with termites, the result of careful experiments, are carried out by the people there is no doubt that the loss of property and crops by this scourge will be greatly reduced.

Division of Inspection.

27. The report of the Inspector of Plants and Produce is submitted as Part V of this report. The staff of this division was increased by the appointment of an European Assistant Inspector, who was stationed at Bonthe.

28. A new Ordinance was passed during the year, the object of which was the consolidation of previous legislation. It also brought piassava under inspection.

29. There is no doubt that the increased staff, together with the tightening of inspection, has shown an improvement on produce shipped from this Colony. In spite of this there is a marked increase in the export of palm kernels during 1928 and there is even a slight increase in the export of piassava. As the latter was only recently put under inspection, the Government has had two piassava instructors working amongst the native producers to teach them the standard required for export.

30. This division is to be congratulated on the useful and effective work done throughout the year to raise the standard of produce leaving this Colony.

Division of Agriculture.

31. A comprehensive report by the Director of Agriculture is submitted as Part VI. This is compiled from the interesting and full reports by the Provincial Superintendents of Agriculture.

32. I consider that during 1928 the Division of Agriculture has achieved steady progress amongst the farmers of the Protectorate. It is indeed gratifying to note the gradual change in the agricultural progess after eighteen years' service. To the ordinary layman and especially one with a little knowledge of the protectorate it is probably not so marked, but there is an undoubted change for the better. This has been achieved within recent years and it is undoubtedly due to the formation of a staff of provincial and district agricultural officers whose object has been a close co-operation with political officers with a view to gaining the sympathy, interest and trust of the chiefs and people. I wish to thank my Provincial Superintendents of Agriculture for the work they have done ; their energy, enthusiasm and loyal support in the various schemes have gone a long way to gain the confidence of the people, and there is no doubt that the District Agricultural Assistants have been imbued by the same keen spirit.

33. Marked progress has been made in the utilization of inland swamps for the cultivation of rice. These vast areas are now gradually being brought into cultivation. I refer you particularly to some figures quoted in the Director of Agriculture's report under the Central Province. I have since heard from the Provincial Superintendent of Agriculture, Central Province, that his estimate of yields from "Government Farms" is lower than the actual yields which are now coming in. Therefore his estimate, calculated on figures of yields of the previous year, of 13,000 bushels of paddy rice, should be far exceeded. This alone means a money value of over £2,500 to these farmers.

34. It has no doubt been noted that the policy of the Government has been to encourage the people in making plantations of economic permanent crops such as coco-nuts, coffee and cocoa. The progress of the schemes within recent years is both marked and encouraging.

35. Useful data and information has been collected from crops under trial at the experimental stations. The more important points have been given in the Director of Agriculture's report.

36. Very satisfactory work has been carried out by the Agricultural Instructor in training the apprentices. The Agricultural Instructor's report, which is submitted as an Appendix to the Director or Agriculture's report, is of interest, as beyond the instructional work very useful experiments have been carried out by the apprentices under the supervision of Mr. D. C. Edwards.

Division of Forests.

37. A full report by the Conservator of Forests is submitted as Part VII of this report. It will be noted that Forestry work was handicapped by shortage of staff and the employment of Forestry officers on the Masanki Oil-palm Plantation and Newton Experimental Fruit Farm.

38. The work of this division was mainly occupied in obtaining requests for the formation of new reserves and the demarkation and constitution of reserves in connection with existing, natural forests. The total protected forest area is 688·42 square miles or 2·5 per cent. of the area of Sierra Leone.

39. Interesting work has been carried out in germination and nursery work. This will prove of great value in the future.

Tsetse Fly Survey.

40. Dr. J. G. H. Frew was occupied throughout the year in making a somewhat detailed survey of tsetse fly areas. Maps have been prepared by him of each area showing the distribution of the different varieties of *Glossina*.

41. Dr. Frew reports that the following species of glossina have been recorded from the Protectorate :—

G. palpalis.—Widespread but not abundant. Absent or very rare in a few areas, Karene, Koinadugu, Eastern Bombali, Mano River and Kenema districts.

G. fusca.—Not abundant except sometimes temporarily and in small areas.

G. pallicera.—One record only from south-west Koinadugu.

G. longipalpis.—Rather abundant in North Karene District where there is a possibility that it may have acted adversely on cattle rearing. Only three records of this fly have been obtained outside Karene District.

42. A few blood films of cattle have been taken, but these are at present insufficient in number to warrant any report.

43. The Entomologist further reports that the impression previously recorded that tsetse fly is not a serious pest over most of the Protectorate and under present livestock conditions has been strengthened.

Fishery Resources of Sierra Leone.

44. His Excellency the Governor was successful in procuring the services of Mr. James Hornell, F.L.S., F.R.A.I., late Director of Fisheries to the Government of Madras, and formerly Marine Biologist to the Government of Ceylon, to carry out a survey of the fishery resources of the Colony and Protectorate. Mr. Hornell arrived in the Colony on March 30, and completed his work here on June 29.

45. Mr. Hornell's investigations and recommendations are available in a most interesting and comprehensive report by him entitled "Report on the Fishery Resources of Sierra Leone." This report is a very encouraging one and there is no doubt that it has evoked considerable interest. A company has been formed to carry out a sea-fishing industry. This company had not started fishing operations by the end of the year, as it was awaiting the arrival of a trawler with European fishing experts.

46. The Colony was very fortunate in procuring the advice and experience of such an expert as Mr. J. Hornell, and there is no doubt if Mr. Hornell's advice is followed by the local fishermen a sound fishing industry could be established resulting in a remunerative living for the people of Sierra Leone.

Reorganization of the Lands and Forests Department.

47. In 1922 the Agricultural and Forest Departments were brought under a Commissioner on the formation of a Lands and Forests Department. Mr. M. T. Dawe, O.B.E., was appointed Commissioner of this new department. To the division of Forestry and Agriculture were added Divisions of Research, Entomology and Inspection. As a result of Mr. Dawe's transfer to Cyprus as Director of Agriculture owing to health reasons, the Government decided on splitting up the Lands and Forests Department after the 31st December, 1928, into two departments, viz. Agricultural and Forestry. The new Agricultural Department will consist of the sections, Headquarters, Provincial, Research (which consists of Chemists, Entomologist and Mycologist) and Inspection. This is therefore the seventh and last report of the Lands and Forests Department.

48. A statement of revenue and expenditure for the year is attached.

I have the honour to be,

Sir,

Your obedient servant,

DOUGLAS W. SCOTLAND,

Director of Agriculture.

APPENDICES.

A.—FINANCIAL.

REVENUE.

	Administration.	Research and Entomology.	Inspection.	Agriculture.	Forests.	Total.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
LICENCES:						
Crown lands	...	...	...	...	76 2 0	76 2 0
Produce	...	...	1,385 7 0	...	...	1,385 7 0
Fines for contravention of Produce Ordinance ...	...	...	303 0 0	...	...	303 0 0
Verification of weights and measures	...	...	83 15 6	...	...	83 15 6
Departmental fines	0 15 0	...	...	6 13 8	1 0 0	8 8 8
FEES OF COURT, ETC.:						
Sale of Government stores	1 8 2	...	...	1 16 3	12 10 6	15 14 11
Sale of produce	...	...	...	62 8 3	...	62 8 3
Sales—rubber from Government Plantations ...	...	...	...	71 8 8	...	71 8 8
TOTAL REVENUE ... ... £	2 3 2	...	1,772 2 6	142 6 10	89 12 6	2,006 5 0

EXPENDITURE.

	Headquarters.	Entomologist.	Research.	Inspection.	Agriculture.	Forests.	Total.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
PERSONAL EMOLUMENTS:							
Salaries	2,044 13 6	1,583 12 6	2,645 2 0	1,462 3 11	6,770 19 3	3,575 0 11	18,081 12 1
Duty allowance	240 0 0	...	...	...	136 0 5	195 8 4	571 8 9
Seniority pay	...	72 0 0	36 0 0	...	...	34 1 3	142 1 3
African Assistant	...	...	...	...	...	3,003 13 1	3,003 13 1
Allowance in lieu of quarters	...	34 5 5	30 13 6	60 13 2	154 9 1	31 9 8	311 10 10
TOTAL PERSONAL EMOLUMENTS *carried forward.* ... £	2,284 13 6	1,689 17 11	2,711 15 6	1,522 17 1	7,061 8 9	6,839 13 3	22,110 6 0

EXPENDITURE—*continued.*

	Headquarters.	Entomologist.	Research.	Inspection.	Agriculture.	Forests.	Total.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
PERSONAL EMOLUMENTS—*brought forward*	2,284 13 6	1,689 17 11	2,711 15 6	1,522 17 1	7,061 8 9	6,839 13 3	22,110 6 0
OTHER CHARGES :							
Chemicals and apparatus	...	70 2 4	302 0 0	...	...	...	372 2 4
Museum outfit	...	...	7 16 2	...	...	...	7 16 2
Collecting specimens for Imperial Institute, etc.	21 15 10	...	...	...	...	...	21 15 10
Handbook of Flora of West Africa ...	158 16 1	...	...	...	...	...	158 16 1
Grant to Imperial Bureau of Mycology ...	125 0 0	...	...	...	...	...	125 0 0
Contribution to Central Forestry Training Institute	200 0 0	...	...	...	...	...	200 0 0
Contribution to Imperial Institute ...	575 0 0	...	...	...	...	...	575 0 0
Electric light and gas plant	...	...	112 14 3	...	...	...	112 14 3
Scholarships in Imperial College of Agriculture, Trinidad	250 0 0	...	...	...	...	...	250 0 0
Contribution to Imperial College of Agriculture, Trinidad	250 0 0	...	...	...	...	...	250 0 0
Library	...	22 19 3	51 1 0	...	21 8 5	23 6 9	118 15 5
Uniforms for African subordinate staff ...	11 16 0	5 14 7	8 11 0	50 12 2	20 6 6	175 19 2	272 19 5
Agricultural shows	...	...	...	...	2 10 0	...	2 10 0
Passages	43 0 0	...	147 1 0	92 12 0	492 5 0	243 13 0	1,018 11 0
Railway fares	139 16 2	95 5 9	88 17 1	203 3 4	958 4 9	350 6 4	1,835 13 5
Transport carriers	28 15 11	84 1 6	42 1 1	330 18 0	1,229 2 11	243 16 11	1,958 16 4
Travelling allowance	4 10 0	37 17 11	34 18 9	130 13 10	434 17 7	359 10 6	1,002 8 7
Transport allowance	75 12 0	50 9 0	14 10 6	17 16 8	163 11 1	104 14 0	426 13 3
Telephone service	76 1 6	...	...	...	44 3 9	...	120 5 3
Inspection apparatus	...	...	...	64 8 8	...	...	64 8 8
Tsetse fly survey	...	516 5 9	...	...	...	...	516 5 9
Contingencies	77 10 7	5 1 8	43 5 1	61 0 8	22 15 3	50 5 8	259 18 11
Agricultural development	...	...	...	...	428 8 0	...	428 8 0
Labour	...	...	...	...	3,705 14 2	1,780 3 0	5,485 17 2
Tools	...	...	...	...	295 4 1	80 3 4	375 7 5
Seeds, distribution of	...	...	...	...	57 10 3	...	57 10 3
OTHER CHARGES—*carried forward* £	2,037 14 1	887 17 9	852 15 11	951 5 4	7,876 1 9	3,411 18 8	16,017 13 6
PERSONAL EMOLUMENTS—*carried forward* £	2,284 13 6	1,689 17 11	2,711 15 6	1,522 17 1	7,061 8 9	6,839 13 3	22,110 6 0

EXPENDITURE—*continued.*

	Headquarters.	Entomologist.	Research.	Inspection.	Agriculture.	Forests.	Total.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
PERSONAL EMOLUMENTS—*brought forward*	2,284 13 6	1,689 17 11	2,711 15 6	1,522 17 1	7,061 8 9	6,839 13 3	22,110 6 0
OTHER CHARGES—*brought forward* ...	2,037 14 1	887 17 9	852 15 11	951 5 4	7,876 1 9	3,411 18 8	16,017 13 6
Seeds, purchase of	...	...	...	...	99 13 11	0 16 7	100 10 6
Laboratory appliances	...	...	...	...	110 16 2	...	110 16 2
Surveying instruments	...	...	...	...	22 11 0	58 19 10	81 10 10
Cotton ginnery	...	...	...	...	...	...	...
Books, stationery etc.	...	...	...	...	26 9 4	...	26 9 4
Rent of experimental stations	...	...	...	...	29 0 0	6 0 0	35 0 0
Rubber tapping	...	...	...	...	61 17 11	...	61 17 11
Tents and camp equipment	...	...	...	...	...	22 3 0	22 3 0
Imperial Agricultural Research Conference	116 2 5	...	...	...	...	...	116 2 5
Fauna of West Africa, contribution to ...	3 14 6	...	...	...	...	...	3 14 6
TOTAL OTHER CHARGES ... £	2,157 11 0	887 17 9	852 15 11	951 5 4	8,226 10 1	3,499 18 1	16,575 18 2
TOTAL LANDS AND FORESTS DEPARTMENT £	4,442 4 6	2,577 15 8	3,564 11 5	2,474 2 5	15,287 18 10	10,339 11 4	38,686 4 2

PART II.

DIVISION OF RESEARCH.

20th March, 1929.

To the Director of Agriculture, Freetown.

Sir,

I have the honour to submit herewith my report for the year 1928, and attach that of the Mycologist.

2. *Museum.*—The Museum continues to be a source of interest to the inhabitants of, and visitors to Freetown, and during the course of the year, 4,949 people visited the Museum. The exhibits are of economic products of Sierra Leone, and samples of similar products of other colonies have been obtained for comparison, while photographs showing the exhibits of Sierra Leone at the various industrial fairs and exhibitions in which the Colony participated are displayed for the information of the public. One or two exhibits of general interest have also been presented to the Museum and are on view.

Chemical Section.

3. The work of the Chemical Section has continued to be concerned mainly with soils but other problems have also had attention. The analysis of oil-palm fruits previously undertaken in the laboratory is now carried out, more roughly, at Njala, the proportion of pericarp to fruit being the only item determined. Many samples of piassava have been brought to the laboratory by commercial firms for an expert opinion as to the quality, but these are not included in the following summary of analyses as no chemical tests were applied.

SUMMARY OF ANALYSES.

Soils:		
Northern Province	52	
Central Province	121	
Southern Province	21	
Colony	25	
Nigeria	6	
Gold Coast	5	
Belgian Congo	9	
Madeira	2	
		241
Waters		6
Fish by-products		2
Manures		2
Spirits		1
Toxicological		1
Bloodstains		2
Miscellaneous		7
		262

4. *Soils.*—During the past year some 241 samples have been submitted for examination. These included six samples from Nigeria, five from Gold Coast, nine from the Belgian Congo and two from Madeira. I have to thank the Directors of Agriculture, Gold Coast and Nigeria, and Mr. Montague Dyke of the Niger Company, Belgian Congo, for their kindness in procuring these soils.

5. The ordinary routine examinations were carried out on all soils submitted and the results are given in the following tables, the samples being grouped in accordance with the provinces or colonies in which they occur.

NORTHERN PROVINCE SOILS.

SUMMARY—(23 SOILS).

Sample Numbers.	Town.	Chiefdom.	District.	Type.	Stones.		FINE EARTH.									
							Sand.		Silt and Clay.		Organic Matter.		pH.		Lime Requirement.	
					Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
2429 to 2434	Kambia ...	Magbema	Kambia	Heavy swamp	Nil		61·0	45·6	54·4	39·0	5·8	1·9	4·7	4·2	·35	·26
2435 „ 2448	„ ...	„	„	Light swamp	20·3	2·8	82·2	74·2	25·8	17·8	4·1	1·7	4·6	4·3	·42	·24
2451 „ 2453	Rokupru ...	„	„	Heavy swamp	0·2	Nil	54·6	32·2	67·8	45·4	10·5	4·8	4·7	4·4	·37	·32
2458 „ 2460	Mambolo ...	Mambolo	„	Light swamp	52·8	8·3	84·4	80·6	19·4	15·6	1·8	1·4	4·4	4·3	·27	·18
2462 „ 2470	Kitchum ...	Samu	„	„ „	7·8	1·4	97·8	80·2	19·8	2·2	2·3	·6	5·6	4·3	·33	·11
2479 „ 2480	Binti ...	Loko Masama ...	„	Swamp ...	3·8	1·5	76·2	72·2	27·8	23·8	10·4	4·6	3·8	3·8	·62	·40

CENTRAL PROVINCE SOILS.

SUMMARY—(100 SOILS).

Sample Numbers.	Town.	Chiefdom.	District.	Type.	Stones.		FINE EARTH.									
							Sand.		Silt and Clay.		Organic Matter.		pH.		Lime Requirement.	
					Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
2569 to 2609 2409 „ 2427 2565 „ 2627	Njala ...	Dasse	Moyamba ...	Sandy ...	1·0	Nil	93·4	56·8	43·2	6·6	3·9	·44	5·6	4·5	·38	·16
2540 „ 2562	Njala (Oil-palm Plantation)	„	„ ...	Sand overlying gravel	71·5	Nil	79·4	48·8	51·2	20·6	3·9	·45	5·0	4·1	·42	·17
2651 „ 2659	Daru ...	Jawi	Pendembu ...	Swamp ...	59·7	Nil	77·2	44·8	55·2	22·8	68·1	2·5	6·9	4·4	·76	·30

SOUTHERN PROVINCE SOILS.

SUMMARY—(21 SOILS).

Sample Numbers.	Town.	Chiefdom.	District.	Type.	Stones.		FINE EARTH.									
							Sand.		Silt and Clay.		Organic Matter.		pH.		Lime Requirement.	
					Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
2485 to 2488 2497 „ 2500	Mabang ...	Ribbi	Gbangbama ...	Sandy ...	10·4	1·4	88·4	77·6	22·4	11·6	2·9	2·1	5·4	4·1	·36	·18
2489 „ 2492 2501 „ 2504	„ ...	„	„ ...	Sand overlying gravel	63·3	0·8	83·2	45·8	54·2	16·8	2·35	0·5	4·7	4·3	·26	·16
2493 „ 2496	„ ...	„	„ ...	Gravel ...	88·8	72·7	71·6	44·8	55·2	28·4	5·12	—	5·8	4·4	·26	·19
2505	„ ...	„	„ ...	Swamp ...	1·1		45·6		54·4		6·99				·46	

COLONY SOILS.

SUMMARY—(13 SOILS).

Sample Numbers.	Town.	Type.	Stones.		FINE EARTH.									
					Sand.		Silt and Clay.		Organic Matter.		pH.		Lime Requirement.	
			Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
2508	Kissi Flats	Gravel overlying laterite pan ...	85·6		74·4		25·6		—		—		—	
2515 to 2525	Newton	Sandy.	Nil		88·6	71·6	28·4	11·4	2·21	1·03	5·5	5·3	·27	·18
2530	Lumley Road	Laterite gravel	45·8		18·4		51·6		5·4		—		·38	

SAMPLES—OTHER COLONIES.

SUMMARY—(19 SOILS).

Sample Numbers.	Colony.	Locality.	Type.	Stones.		FINE EARTH.									
						Sand.		Silt and Clay		Organic Matter.		pH.		Lime Requirement.	
				Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
2527	Nigeria (Northern) ...	Minna	Sandy ...	0·5		88·8		11·2		·78		6·9		·02	
2528	„ „ ...	Samuru	„ ...	Nil		91·4		8·6		·62		6·9		·06	
2529	„ „ ...	Kano	„ ...	0·5		87·2		12·8		·59		6·9		·04	
2539	„ „ ...	Illorin	„ ...	2·3		67·0		33·0		1·17		6·2		·10	
2537	Nigeria (Southern) ...	Agage	„ ...	Nil		92·6		7·4		1·2		6·7		·04	
2538	„ „ ...	Ibadan	Gravelly ...	18·7		84·0		16·0		2·56		6·5		·06	
2628	Gold Coast	Accra	Sandy loam ...	Nil		58·4		41·6		1·72		6·5		·12	
2629	„ „	Aburi	„ „ ...	6·4		55·0		45·0		4·11		6·5		·02	
2630	„ „	Kuraban	Sandy ...	Nil		70·6		29·4		1·06		6·6		·09	
2631	„ „	Koforidua	„ ...	Nil		73·8		26·2		2·05		6·8		·03	
2632	„ „	Abetifi	„ ...	1·7		73·8		26·2		1·55		6·6		·09	
2637 to 2644	Belgian Congo	Leverville	„ ...	·2	Nil	95·6	80·0	20·0	4·4	·676	·233	6·9	4·3	·2	·03

6. *Special Soil Investigations.*—Research work on the composition of lateritic soils has been continued. The results of the investigations prior to 1927 were published, as mentioned in last year's report, in *the Journal of Agricultural Science* (Vol. XVII page 530) and more recent investigations will, it is hoped, shortly be sufficiently far advanced to admit of publication. The more recent work may be summarized as follows :—

I. A further study has been made of the formation of lateritic soils in Sierra Leone and the composition of the intermediate and final products ascertained. The process of transformation from the original norite rock to the final laterite rock has been followed out and analyses of the various intermediate products made.

II. Lateritization may take place on the periphery of a rock and subsequently the iron may be removed leaving gradually accumulating masses of bauxite. In other cases the iron may not be removed, and some may even be brought in from outside; this may result in the formation in situ of the vesicular red rock typical of laterite.

III. The detrital lateritic soils of Sierra Leone Peninsula appear on the whole to contain a higher proportion of alumina to silica than the residual lateritic soils.

IV. The soils described are all reddish or yellowish red soils, darkened in the top foot by humus. They are light in texture and generally contain a high proportion of stones. They are acid in reaction and have a definite lime requirement. The mineral constituents are low, especially potash and exchangeable calcium.

V. Phosphorus is present in fair quantities, but owing to the presence of large quantities of iron and aluminium a considerable proportion of it is not available and soluble phosphorus is readily removed from solution by these soils.

7. *Other West African Soils.*—Soils were procured from other West African colonies and from the Belgian Congo in order to compare the soils in Sierra Leone with those of the neighbouring colonies. It was found on analysis that soils frequently described as laterite soils in West Africa on account of their red colour could not be regarded as laterite on any accepted definition of the term "laterite." Only a small proportion of the soils examined were lateritic, and it appears probable that such soils are of a more limited occurrence than was once thought probable.

8. There were other very interesting points. The soils of the Gambia, Gold Coast, Nigeria and Belgian Congo were on the whole all markedly lower in phosphorus than the Sierra Leone soils but richer in potash, although this was not so marked in the case of the Gambia and Belgian Congo soils.

9. The organic matter and nitrogen were on the whole greater in those colonies, or those parts of colonies, with the higher rainfall; the organic matter was low in the soils from the northern part of Northern Nigeria and Gambia. In all the West African soils examined the exchangeable calcium was low, sometimes noticeably so.

10. There appeared to be certain similarities between the soils of different colonies when drawn from those parts of the colonies with similar climates. Not sufficient soils were examined to do more than to indicate similarities and contrasts between the soils of the various colonies, but there were certainly indications that what similarities and contrasts existed were due mainly to climate, and this is a point that needs thorough investigation. Unfortunately these are points which cannot be fully investigated by the limited staffs and travelling facilities of chemists in individual colonies, and this important work will have to wait until a centre is established in West Africa where soil research work of this nature can be carried on.

11. *Oil-palms.*—The oil-palm work at Njala has been carried on by the Mycologist and in place of the elaborate oil extractions in the laboratory a rough idea of the oil content of the fruit has been obtained by removing the pericap from the nuts and taking the oil as composing half the pericarp On the average, determinations so made agree very well with the results of oil extractions made in the laboratory.

12. *Plantations Yields.*—The yields per acre of oil and kernels, worked out on figures obtained in the laboratory for the different types of fruits, and the yields of fruit as given in the Mycologist's report are as follows :—

	Yield of Oil per Acre.	Yield of Kernels per Acre.
	Lb.	Lb.
Thick-shelled type ...	914	440
Thin-shelled type ...	987	240

13. The yield per acre on the Nigerian oil-palm plantation as calculated from the Mycologist's figures and taking the number of trees at 75 per acre (the number actally present in the plantation) works out as follows :—

Thick-shelled type	...	...	3,656 lb. per acre
Thin-shelled type	...	...	2,719 „

14. These yields have shown a definite increase on the yields obtained last year, and the steady increase in fruit produced and the amounts of oil and kernels obtained are very promising in view of the large area which is being planted at Mabang from these two types of seed.

15. During 1928, an article on the "Oil Palm Industry" by F. J. Martin was published in "Tropical Agriculture" (Vol. V pp 189–193). This article gave a résumé of the world's products of palm oil and kernels and reviewed the possibilities of further production in the East Indies, West Africa and the Belgian Congo. It showed the steps being taken by the various West African colonies, including Sierra Leone, to stimulate the production of palm oil of a good quality for export purposes.

16. A further paper on the "Extraction of palm oil" has been prepared and has been approved for publication. This paper describes native methods of extraction, various modifications designed to improve native methods, small (hand power) plants for oil extraction and present day factory methods.

17. *Piassava.*—The recommendations of the chemical section with respect to this product, which were given in last year's annual report, have been put into effect by the department. The export of this fibre has been brought under the Native Produce Ordinance and piassava instructors have been sent to the piassava swamps to teach the native workers what methods to employ to improve their fibre. Frequently samples of fibre are referred to the laboratory, both by the Inspector of Plants and Produce and commercial firms, for an opinion as to the quality of the fibre. As no chemical analysis is made, and only a personal opinion given, these samples are not included among the ordinary list of samples given in paragraph 3.

18. *Fish Guano and Fish Oil.*—In connection with the establishment of a fish curing factory in Sierra Leone, this laboratory undertook the examination of fish guano and fish oil produced by preliminary trials.

19. The fish guano was derived from the residue of fish which had previously been boiled and subjected to pressure to extract the oil. This residue consisted of fragments of bones, flesh and scales of fish, and on analysis yielded the following figures :—

Moisture	...	...	...	11·0 per cent.
Nitrogen	...	...	...	7·9 per cent.
Phosphorus (as P_2O_5)	...	...		11·9 per cent.
Potassium (as K_2O)	...	...		0·5 per cent.

This fish waste provides a manure similar in type and composition to that of many other fish manures produced in various parts of the world and should be worth from £8 to £10 a ton.

20. *Fish Oil.*—The oil was obtained by boiling fish, most of which was of the variety known locally as "Bonga." The oil was skimmed off the top during boiling, and subsequently the broken fish was subjected to pressure and the oil it contained was squeezed out. The oil so obtained was mixed with fragments of fish and water ; it possessed a penetrating and disgusting odour. On filtering a clear golden yellow oil was obtained which on analysis yielded the following results :—

Moisture and matter volatile at 100°C			...	0·39 per cent.
Specific gravity at 26·5°C	...	...		0·918
Refractive index at 26·5°C	...	...		1·4705
Free fatty acid, expressed as oleic acid			...	2·33 per cent.
Saponification value	...	...	...	199·1
Unsaponifiable matter	...	...	...	0·9 per cent.
Iodine value	...	...	...	105·9

The oil, it will be seen, is similar to fish oils obtained in other parts of the world.

21. *Waters.*—Six samples of water were examined on behalf of the Public Health Engineer. The most important of these, from the point of view of the Research Branch, were those from the new wells at Njala. The analyses showed that the waters of these wells were contaminated from some outside source and subsequent investigations by the Sir Alfred Jones Laboratory disclosed certain obvious sources of contamination. It is hoped that steps will be taken to close up the mouths of these wells so as to render the wells immune from casual contamination.

22. It has further been reported that the wells show signs of running dry in the dry season and steps should be taken to augment the supply.

23. *Miscellaneous.*—The results of examination of blood stains, toxicological specimens, samples of spirits and other miscellaneous material of a non-agricultural nature were reported upon separately, and call for no further description in this report.

F. J. MARTIN,
Agricultural Chemist in charge of Research Branch.

AGRICULTURAL DEPARTMENT,
FREETOWN.

PART III.

REPORT ON THE MYCOLOGICAL SECTION.

During 1928 only two short treks were undertaken by the Mycologist, the rest of the time being spent at headquarters at Njala except for visits to Freetown, Mabang Oil-palm Plantation and Newton. The first half of January was spent in the Scarcies area of the Northern Province, and during the latter half of August a trek was made through the Makump-Bumban area of the Northern Province, where considerable areas of ground-nuts were visited.

2. As in 1927, much of the time was spent on oil-palm investigations, and a report on the data from the Nigerian oil-palm plot at Njala for the years 1926, 1927 and 1928 has been prepared for publication.

3. A pamphlet was published in 1928, dealing with Garden Pests and Diseases in Sierra Leone, in conjunction with the Entomologist.

4. The Imperial Bureau of Mycology have been very helpful with advice and have identified a number of specimens, and thanks are also due to the staff of the Herbarium, Royal Botanic Gardens, Kew, who have identified a large number of specimens of flowering plants.

(*a*) *Mycological Investigations.*

The parasites are arranged under their respective host plants :—

BANANA.

5. Bananas on a low lying plot near the river at Makump were reported by the Provincial Superintendent of Agriculture, Northern Province, to be badly attacked by a disease of the stem. An agaric (*Marasmius* sp.) was present in all cases. The attack was specially noticed in December. The variety "Guinea Negro" was most badly attacked, while Canary bananas were slightly affected. These "Guinea Negro" bananas are also attacked by Panama disease, which does not appear to kill this variety at Makump.

CACAO.

6. White thread blight (*Marasmius Scandens* Mass.) has been found on cacao trees in several localities. It is apparently not yet common on cacao in Sierra Leone, but is widespread on kola. Cacao trees should be examined carefully, and if thread blight is discovered the affected branches should be cut off and burnt.

7. What appears to be Pink Disease (*Corticium Salmonicolor* B. st Br.) has been, reported on cacao from three localities in the Southern Province, and from Makump in the Northern Province. The fungus has not been definitely identified yet. A careful watch should be kept for this disease which might prove serious in such a wet climate as this. The diseased branches should be cut off, and burnt as soon as possible. It may be advisable, especially if further serious infection occurs, to paint the trees with bordeaux paste.

CAPE GOOSEBERRY.

8. A leaf crinkle disease appeared on some Cape gooseberries which were growing at Njala near some small-fruited chillies (q.v.) affected with a similar disease. The disease is suspected to belong to the virus class, and if so, from the position of the Cape gooseberry plants, it is suspected that the virus is the same as that attacking chillies.

Cassava.

9. *Mosaic.*—During the year, a survey of the distribution of cassava mosaic in Sierra Leone was commenced with the help of the Agricultural and Political officers. The disease appears to be common only in the Colony and along the coast east of Freetown. It is present in many parts of the Southern Province, but at few localities elsewhere.

The disease apparently spreads very slowly indeed. Though comparatively little is known about it, there is reason to believe that it could be easily eliminated from Sierra Leone if the measures suggested are carried out. In places where the disease is not abundant, diseased plants should be carefully removed, as they are found from time to time, with *all* the roots and *burnt*. Cuttings from healthy plants only should be used for planting.

When the disease is abundant and cassava has been grown for some years, the eradication of the disease is more difficult. When the diseased cassava crop is ready to be dug up, care should be taken to remove as many of the roots, even the smallest, as possible. All the small useless roots together with the stems should be burnt. As it is difficult to make sure of removing all small pieces of root from the ground when harvesting the crop, some other crop such as guinea-corn, maize or yams, which can be easily weeded without disturbing the plants, should be grown on the land next year, and as the cassava grows up from the small pieces of root remaining in the ground from the previous year, these cassava plants should be carefully dug up and burnt. When the land is clear of all diseased cassava, cassava can be planted again on the land, and if it comes from healthy cuttings, will be free from disease. It should be looked at once or twice a month and any cassava plants to which the disease has been carried from neighbouring plots should be carefully dug up and burnt, but as the disease spreads slowly there is small risk of a large number of plants becoming so infected.

10. The occurrence of mosaic on Ceara rubber which was recorded in the annual report of the Lands and Forests Department for 1926 should he cancelled. The Ceara rubber trees near Freetown where the mosaic was reported to have been seen in 1926 have been visited at several different times since, but the disease has never again been noticed, though the majority of the cassava plants in the neighbourhood are mosaiced. The record of mosaic on Ceara in the annual report for 1926 was therefore probably made in error.

Chillies—(*Capsicum*).

11. A leaf crinkle disease, which may belong to the virus class, appears to be common, especially on the small-fruited variety of chillies, though it has also been found on larger-fruited varieties. It is not known how much damage is caused by the disease.

12, Fruit rot is common on the larger-fruited chillies Two distinct strains of *Colletotrichum* were isolated from such rotted fruits. Die-back, also caused probably by a *Colletotrichum*, is common.

Citrus.

13. Scab is common on the fruits of lemon and sour orange, and is very bad on the leaves of young grape-fruit four to five years old at Njala. Climatic conditions at the end of the rainy season (July to September) appear to be very favourable for infection, the temperature being comparatively low (average minimum 70 degrees) and the humidity being great, with dew at night. The young grape-fruit leaves were very badly attacked at this season in 1928. Lemon stock has been used for many of the young citrus tree at Njala, and when this has begun to grow out the leaves are invariably scabbed.

14. Gummosis has been found on lemons and sweet orange at Njala.

15. *Gloeosporium* spots have occasionally been found on the leaves of lemon, grape-fruit and citron at Njala.

16. A "fly-speck fungus" is fairly common on the fruit of grape-fruit, and has also been found on the leaves of St. Michael orange at Njala.

17. Neither "wither tip" of limes nor Citrus canker has so far been found in Sierra Leone.

Coffee.

18. A leaf blotch was fonnd on young trees of *Coffee Liberica* at Kambia, Northern Province, in the dry season of 1927–1928. The trees were only 3 feet high and growing unshaded. The blotch extended inwards from the edge of the leaf, and was grey in colour. *Pestalozzia Coffeæ* Zimm. was associated with the blotches, but it seems probable that lack of shade was primarily responsible for the disease.

Groundnut.

19. *Rosette Disease.*—An aphid, *A. laburni*, is found very commonly on rosetted ground-nut plants and less frequently on non-rosetted plants, and it seems probable that this is the vector for rosette disease in Sierra Leone. The symptoms of the disease are the same as described for South Africa.

Observations in the field seem to show that early plantings of ground-nuts tend to escape serious disease. The first signs of disease on a plot are isolated rosetted plants. On the Experimental Farm at Njala, the first rosetted plants usually appear on the side of the plot nearest to plots on which ground-nuts were grown the year before. This was especially noticeable on the Apprentices' farm this year. At Njala, the disease in 1928 first appeared to spread rapidly about the end of June and during July. There appears to be some evidence that the rapid spread of the disease is correlated with the appearance of winged aphids.

The disease is more serious on permanently cultivated land than on land cultivated according to the native shifting method, and at Njala and round larger towns the disease is very serious.

Rosette disease may be carried over the dry season on volunteer ground-nut plants which are often rosetted. Aphids have been found on ground-nut plants which come up during the dry season. Infected volunteer plants, however, do not appear altogether to account for the carrying over of the disease from one wet season to the next.

20. *Cercospora* on ground-nuts appears to be local in distribution, and while in some areas it causes serious damage, in others it is not of great importance. Attacks are very severe in places where land is under permanent cultivation and where ground-nuts are regularly growng, as at Njala Experimental Farm. In severe cases the *cercospora* attacks the young fruit "pegs," causing them to shrivel before reaching the ground. In the hilly area between Mabonto and Bumban, which was visited in 1928, the attack seemed to be worse in the valleys than on the sides of the hills.

Sclerotium rolfsii was found on ground-nuts in several localities in 1928. The fungus grows on both living and dead stems and leaves, the usual attack on a living plant beginning on a stalk which is lying on the ground.

Conditions are probably made more favourable for attack by *sclerotium* by the native operation of "trampling the ground-nuts to make the stalks lie down on the ground, an operation which, the natives state, makes the plant give more fruits since the fruit "pegs" have a shorter distance to travel to the ground. This statement, however, needs verification by experiment. The stems and leaves are generally broken and wounded in the process, and in the height of the rains, *sclerotium* readily attacks such weakened plants. Sowing on ridges and beds is probably preferable, and "trampling" is to be discouraged. The *Sclerotium* disease is probably not serious except under excessively moist conditions, and the native practice of growing ground-nuts on hill sides is therefore to be commended.

Guinea-corn.

22. Grain Smut, caused by *Sphacelotheca sorghi* (Link) Clinton, was found on one panicle of guinea-corn (*Sorghum guineense* var *tremulans* Stapf) grown at Makump, Northern Province, from seed imported in 1928 from French Guinea. This is the first record of the disease in Sierra Leone, and it has not yet been found on native varieties of guinea-corn (*Sorghum margaritiferum* Stapf.

23. A common disease of guinea-corn (*S, margaritiferum*), especially in the wetter parts of Sierra Leone, appears to be caused by *Fusarium herbarum* (Corda) Fr. The inflorescence looks "mouldy." Attacked grains are shrunken and often dark in colour. This disease has been commonly referred to in Sierra Leone as "smut" and is not to be confused with the true smut disease reported above.

Kola.

24. White thread blight (*Marasmius scandens* Mass) appears to be common and widely distributed on kola. It is not so conspicuous on this host as on cacao, probably because, under the ordinary native cultivation, the leaves of the kola trees are not very numerous, and the shade and moisture conditions are therefore not so favourable for the growth of the fungus as on cacao.

Lettuce.

25. Lettuces in certain parts of the Freetown area are badly attacked by eelworms. The roots are covered with galls, and the plants wilt and die.

Maize.

26. *Physoderma zeae—maidis* Shaw was found at Njala and near Makump, Northern Province, this year. The attack was not serious.

27. *Helminthosporium turcicum* Passer, causing leaf-blotch, was found commonly on maize, but doing comparatively little damage.

Mango.

28. Anthracnose was very bad on the mango trees at Njala in 1928. There appear to be two kinds of attack on the leaves, both associated with *Gloeosporium*, but perhaps with different strains of the fungus. On young succulent reddish leaves and on the leaf stalks and young shoots, small brown spots not more than 1 mm. across were abundantly produced in October, 1928, followed by a serious leaf fall, on certain trees. The other kind of attack causes large brown spots, 1–2 cms. across, on the young yellowish leaves. Leaf fall is not great, but discolouration of the leaves occurs when the leaf spots are numerous.

Spotting of the fruit caused by *Gloeosporium* has also been bad at Njala in the dry season of 1928–1929.

Oil-palm.

29. *Crown Disease.*—On the Kawei and Henoi oil-palm plots at Njala, which were planted in August, 1924, nearly all the trees which were reported (annual report, 1927) to be affected with crown disease have recovered and are now quite normal in appearance.

30. *A Pestalozzia* was associated with grey spots on the leaves of seedling oil-palm at Mabang and at Bumban, Northern Province, but it was thought that unfavourable conditions were responsible for the weakening of the plants.

31. A rotting of young and half ripe heads and of heads with mature fruit, thought to be due to fungal attack, was observed in March and April, 1928, in the Nigerian oil-palm plantation at Njala. The disease did not appear at any other time of the year on heads with mature fruit. Abortion of young female inflorescences before or just after anthesis is common at all seasons, and is not necessarily due to parasitic attack, but it is possible that, at certain seasons at least, fungi are responsible for the abortion of some of such young inflorescences.

The attack seemed to be confined to certain trees, scattered through the plot, and most of the heads of these trees were rotted. An agaric, probably a *Coprinus*, seemed to be constantly associated with the rotted and aborted heads on these trees, but was presumably saprophytic. The causal agent has not yet been found.

Pigeon-pea.—(*Cajanus indicus Spreng.*)

32. A rust (*Uredo cajani Syd.*) is common on older leaves of pigeon-pea at Njala.

Turnip.

33. A small grey spot about 1 inch across at the edge of a turnip leaf at Njala was covered with pycnidia of *Macrophomina phaseoli* Ashby. Cultures were readily obtained from the pycnidia and were identified by the Imperial Bureau of Mycology as typical *Rhizoctonia bataticola*. The fungus was only found on one turnip plant, and the damage done was negligible in this case.

Rice.

34. *Helminthosporium oryzae* Breda de Haan was common, as usual, on the leaves, causing a leaf spot, and on the glumes. Considerable reduction in yield is probably caused by this fungus.

Tomato.

35. *Bacterial Wilt.*-Tomatoes in Sierra Leone are very commonly affected by a serious wilting disease which agrees in symptoms with that caused by *Bacterium Solanacearum* in other countries. On the stems are formed numerous small wart-like processes, more or less in rows, and the lower leaves are reflexed. The tomato plant wilts and eventually dies. A brown discolouration of the wood at the base of the stem can be seen if this is split open.

If the bacterium is the cause of the trouble, plants are infected probably through wounds in the roots, which may occur in transplanting, especially if the plants are too large at the time, or through eelworms which are very common on tomatoes in this country.

Yams.

36. *Leaf Spot.*—One or two fungi cause leaf spots on yams which, though not serious on most yams, are occasionally serious on some, such as the Esuru yam. The Water yam is in some places very badly attacked every year, the vines of the plant being black and shrivelled by the end of the rainy season. The leaves of this yam are commonly covered with black shiny spots, but possibly the extensive death of the aerial parts is due to some other organism.

Spraying with Bordeaux mixture might be effective, and should be carried out at intervals during the rainy season, at least on water yams and esuru yams.

37. *Sclerotium rolfsii.*—A leaf spot was frequently found on Chinese yams at Njala, caused apparently by *Sclerotium rolfsii*, and similar specimens were received from Makump, Northern Province. The leaf spot is circular, grey with a dark margin, and concentrically zoned, and is generally about 1 cm. across though it may cover half the leaf when the leaf is very old. It has only been found on the older leaves towards the base of the plant. White radiating hyphæ are often visible over the surface on the spot, and sclerotia of *Sclerotium* were found in certain cases near the centre of the spot.

38. *Bagnisiopsis dioscoreae* Wakef.—This fungus causes a witch-broom growth of the stems. Generally only separate branches of the stem are attacked. The internodes are shortened, the stem is contorted, and the leaves on the affected part are small and yellow. The fungus forms a thick stroma in the cortex, which it replaces, and eventually bursts through the epidermis and the stems are covered with an irregular dark brown mass of fungus tissue in which the perithecia and spores are borne. The leaf stalk and veins are occasionally attacked.

The fungus attacks White yams especially and also occurs quite commonly on wild yams in the bush. It may occasionally be serious. Since only branches of the stem are attacked, these can be cut off at the base when noticed, and burnt. The symptoms are readily noticeable long before the fungus produces spores, and if this pruning is carried out early in the year, the disease should not be troublesome. Wild yams in the vicinity should also be inspected and cut down and burnt if infected with this fungus.

Other Parasitic Fungi of Economic Importance.

39. *Rhizoctonia salani.*—Cultures made from sclerotia on French bean and "Bush greens" (*Amaranthus caudatus*) were identified by the Imperial Bureau of Mycology as belonging to the *Rhizoctonia solani* group. The same fungus was found on carrot and orchid (*Lissochilus purpuratus* and *Brachycorythis*) leaves in 1928, and is probably one of the commonest garden fungi in the country. It appears to attack only the parts of plants at or above soil level, and is especially abundant on the leaves.

The fungus is most destructive during the wet season. When, as often happens with turnips and greens, only a few leaves are affected, these leaves should be picked off and burnt. Overcrowding of plants should be avoided and different crops should be grown on the ground in successive years. If plants are badly attacked it is best to pull them all up and burn them to prevent the fungus from spreading to others. French beans resist the attack for a longer time if sprayed with Bordeaux mixture when the plants are young.

40. *Sclerotium rolfsii* sacc. This fungus was very commonly found in 1928. It was observed on Red Lilies (*Hippeastrum*) seedling avocado, on ground-nut (*q.v.*), Chinese yam (*q.v.*) Caladium, Canavalian bean (on pod), and on banana suckers in transit. It may prove a troublesome fungus in gardens.

A diseased stretch in the middle of a row of Red Lilies was treated successfully in June The diseased bulbs were removed and the ground was soaked with ammoniacal copper carbonate solution. Fresh bulbs were planted and no further *Sclerotium* attack was noticed. The effect of this particular treatment is doubtful, however, since the fungus appears to be unable to stand desiccation and other adverse conditions.

Caladium plants growing on an open verandah were commonly attacked by *Sclerotium*, the fungus rotting the leaves at soil level, but it was found that if the plants were placed in the open for a time and not given excessive water, they recovered, and the *Sclerotium* apparently died. A seedling avocado which was rotted at the base of the stem was not watered for a month and allowed to dry up. At the end of this time no visible sclerotia could be found, although mature brown sclerotia were present.

Any methods of cultivation which tend to keep the plants sufficiently spaced apart from one another and which keep the soil in a moist but not water-logged condition will therefore be beneficial.

Diseases of Wild Plants.

41. Specimens of fungi parasites on wild plants were collected from time to time during the year. The following have been identified by the Imperial Bureau of Mycology :—

Cintractia peribebuyensis Speg. On *Cyperus zollingeri* Stend. At Kitchom, Great Scarcies River, Northern Province.

Ustilago rabenhorstiana Kühn. On *Digitaria longiflora* Pers. At Tombo, Little Scarcies River, Northern Province.

Records of Other Fungi.

42. The following have been collected as saprophytes in Sierra Leone during the year :—

(?) *Amauroderma rugosum* (Nees.) Bres.

On the ground in rubber, oil-palm and kola plantation, Njala.

Polystictus funalis Fr. On dead wood.

Trametes incerta Curry on a dead tree killed probably by *Ganoderma.*

(b) *Herbarium.*

42. About 500 specimens of flowering plants were collected in Sierra Leone during the year and added to the departmental herbarium. A number of the specimens were collected by Mr. R. R. Glanville, Provincial Superintendent of Agriculture, Northern Province. Duplicates of these specimens were sent to the Royal Botanic Gardens, Kew.

43. Living tubers of a number or different kinds of yam, both wild and cultivated, were sent to Kew for growing, and duplicate tubers were planted at Njala.

(c) *Oil-palm Investigations.*

44. During the year, fruits were harvested for the first time from the plot of native "Kpolei" oil-palms which were planted in September, 1925, and also from two of the six Angola oil-palms at Njala, which were planted in August, 1926, from seedlings raised from seed from Angola.

Nigerian Oil-palm Plantation—Njala.

45. This plot is now in its 8th year after planting.

46. The yield during 1928 was as follows :—

Number of Heads Harvested.	Weight of Heads Harvested.	Weight of Fruit Harvested.
2,289	22,936 lb.	13,227 lb.

47. The average weight of fruit produced per bearing tree of the two main types for 1928 was as follows :—

Thick-shelled type	48 lb. 12 oz.
Thin-shelled type	36 lb. 12 oz.

48. As in 1926 and 1927, there was in 1928 a larger proportion of high yielding trees in the thick-shelled than in the thin-shelled group. The highest yielding thick-shelled type tree in 1928 gave 149 lb. of fruit, compared with 125 lb. for the highest yielding tree of the thin-shelled type.

49. Although the tree with the highest total yield for the three years 1926–1928 is a thick-shelled type tree which has given 256 lb. of fruit, as compared with 204 lb. for the highest yielding tree of the thin-shelled type, the thin-shelled type is still the more valuable because of the higher proportion of oil in the fruit.

50. Data were collected in 1928 of the number of male inflorescences coming into flower in each month. The number is very small and only in one month (November), a month in which the number of female inflorescences at anthesis was very small, did the number of male inflorescences exceed the number of female inflosescences at anthesis. The average number of male inflorescences flowering during the year was only 0·4 of the number of female inflorescences.

51. A report on the history and data collected up to the end of 1928 has been prepared for publication. Periodic fluctuations in the average weight of head, average weight of fruit per head, etc., have been noted.

F. C. DEIGHTON,
Mycologtst.

Agricultural Department,
Njala,
14th March, 1929.

PART IV.

REPORT ON THE ENTOMOLOGICAL SECTION.

SECTION I.

14th February, 1929.

THE DIRECTOR OF AGRICULTURE, FREETOWN.

SIR,

I have the honour to submit my annual report for 1928.

2. Most of the time has been taken up in connection with citrus, ground-nut, kola, oil palm, locusts and termites.

3. With regard to cacao, it is of interest to note that two of the important pests of this crop in the Gold Coast, viz. *Sahlbergella singularis* and *S. theobromæ*, have been recorded from Sierra Leone. Only one specimen of each was collected, but none has yet been observed to attack cacao.

4. *Cassava.*—Some observations have been made in relation to "virus" disease. In areas where this is most prevalent, mites and mealybug are very numerous. *Aleurodidæ* also occur, but in very small numbers, and are almost universally distributed.

5. *Citrus.*—Fruit piercing *lepidoptera* are very prevalent, affecting orange, grape-fruit tangerine and sweet lime, but not lemon or lime. These mainly affect the crop which matures about April, causing the whole of it to fall.

6. Night collection resulted in the following species being taken, the first being most numerous :—*Othreis fullonica*, L., *Achaëa catocaloides*, Guen., *A. lienardi*, Boisd., *Hypocala rostrota*, F., *Erebus walkeri*, Butl. and *Dermaleipa rubricatæ*, Holl., all of the family *Noctuidæ*. In addition, a Nymphalid, *Charaxes numenes*, Hew. attacks the fruit during the day.

These are present mainly during the month of April, May and June, to a much less extent during November.

During the season four moths may be seen feeding on a single fruit.

Some of the above *Lepidoptera* also attack the fruit of cashew and mango.

7. Imported citrus stock, placed in the nursery previous to planting out, was attacked by Termites. Some were treated by means of a soil injector with carbon bisulphide at the rate of 10 ccs per plant, applied at a distance of 8 inches from each plant at a depth of 3 inches. Others were treated with para-dichlorbenzene at the rate of $\frac{1}{4}$ ounce per plant, this being distributed in a circle of 3 inches radius at a depth of 2 inches from the surface, the soil being afterwards replaced.

In both cases the results were very marked, as within a week, new shoots nearly a foot long had been produced.

8. *Coco-nut.*—Aspidiotus destructor has caused little further damage, as the natural enemies are now widely distributed.

9. Some of the entomogenous fungus, *Pseudomicrocera henningsii*, was collected and sent to Conakry at the request of the Agricultural Service there, but no report has been received as to its establishment or otherwise.

10. *Coffee.* A few plants have been badly attacked by a mealybug, which was parasitised to some extent by a Hymenopteran and was also affected by the predaceous larva of a Lycænid (*Lepidoptera*).

11. *Ginger.—Blastobasis byrsodepta*, Meyr., was bred from stored material.

12. *Ground-nut*—The aphis attacking this crop has been identified as *aphis laburni*, Kalt., and is important in view of its possible connection with "Rosette disease." Some observations have been made relative to these two. Another possible vector of the disease is a capsid, *halticus tibialis*, *Reut.*, which is very common, also occurring in large numbers on certain weeds.

Experiment had to be discontinued owing to the impossibility of procuring supplies of good seed.

13. *Kola.*—The tree referred to in paragraph 16 of my 1927 report, which was used for *pruning* experiment and yielded 20 pods in November of that year, gave 70 pods in June, 1928. In September, there was promise of an exceedingly good crop, and the tree was sprayed with:—

Tobacco powder	...	...	...	...	1 lb.
Soap (hard)	...	...	...	...	1 lb.
Water	...	...	...	...	8 gallons.

Unfortunately, for some unknown reason, practically all the leaves and flowers fell off after a week, and only ten pods were obtained in December, 1928. These pods, however, were the best for cleanliness, regularity of shape, general appearance, nut content and size of nuts that have been seen. It is hoped that a more than normal crop will be produced in June, 1929.

14. Pruning on a large scale was carried out early in the year, and in September, but it is unfortunate that records of yield are not available for June, as almost the whole crop was stolen. For December, 1928, the yield had increased over 300 per cent. compared with December, 1927, whereas the unpruned plot had a decreased yield of nearly 50 per cent.

15. With regard to *Psyllid* (*Mesohomatoma tessmanni*), experiments are in progress with regard to its control by means of a strong jet of water which removes practically all the nymphs, and it is likely that if carried out at suitable intervals it will be a means of control.

16. In connection with the weevil (*Balanogastris kolæ*) and other insects attacking the nuts, some simple method of preventing further infestation and obviating the necessity of the repeated sorting which is the routine at present, is urgently required. The experiments tried are:—

(*a*) Placing in some liquid until required, when they could be washed if necessary before packing for shipment; this would also render the regular changing of the cover of leaves unnecessary.

(*b*) Fumigation of the nuts to kill any insects or larvæ that may be present.

With regard to (*a*), brine of strengths varying between 1·87 per cent. and 30 per cent. was tried, but although the nuts kept in apparently good condition for two months, except that the red nuts were much faded, they were rendered unpalatable even when the salt was removed. Some other material is to be tried.

In the case of (*b*), carbon bisulphide was used at the rate of one ounce per 15 cubic feet of space, for periods varying from half-an-hour to one-and-a-half-hours, and in all cases the contained insects and larvæ were killed, but all kinds of nuts badly discoloured.

17. Hydrocyanic acid gas generated from one ounce of potassium cyanide per 100 cubic feet of space was used for periods varying from four to nineteen hours. After nineteen hours all insects were killed, but the nuts were ruined by discoloration.

18. *Maize.—Anomis leona, schs.*, and *busseola fusca*, Hmps., have been bred out from the stalks.

19. *Oil-palm.*—The mealybug (*Pseudococcus brevipes*) and various other *coccidæ* which attack the fruit heads of oil-palms, have been on the increase in the Nigerian plot at Njala, and measures are to be taken against them next year, when an endeavour will be made to arrive at some estimate of the damage caused. As in the case of mealybug, the insects are between the bases of the fruits, and in addition are covered by earth placed there by attendant ants, it appears likely that no ordinary spray will reach them, so a supply of calcium cyanide has been obtained for the purpose.

20. Palms in the nursery of the Masanki plantation were reported to be seriously affected, in many cases killed, by a caterpillar which lives in the centre of the plant. Only one adult has been bred out, but it has not yet been identified.

Locusts. (*Zonocerus variegatus, L.*)

21. The egg masses have now been located, the first being found in September, and hatching commenced towards the end of that month. The contents of each mass varies between twenty and eighty eggs, the average being about fifty, and in some areas there was more than

one mass per square inch of surface. The top of the mass is about one inch below ground level. Thousands of masses have since been dug up, and little further trouble in treated areas is anticipated.

22. The adults select two year old or similar bush for oviposition, and in many cases the breeding areas are very localized. Hatching continued until the end of December.

23. With regard to poison bait, this has continued very effective, and experiments are in progress pointing to a reduction in the amounts of Paris green and salt necessary.

Termites.

24. Eighteen mounds, including nests in walls of houses, have been successfully treated by means of carbon bisulphide.

25. In the case of stores, houses, etc. with mud floors, termites cause a great deal of damage, and it has been found that if the floor be cleared of dust, then Paris green swept over it at the rate of one ounce for each 12 square feet and allowed to remain, the floor being brushed over at intervals of a few days for two or three weeks, no further damage results.

This substance is also efficacious when placed on shelves, etc., where books and other materials may be kept; also, as a paint, for window frames and other wood-work.

From the influence which Paris green appears to have on termites, experiments are to be made on mounds, the powder being injected by means of a dusting machine.

Collections and Specimens.

26. The reference collection will be arranged as soon as the new accommodation is ready for occupation.

27. Numerous specimens have been collected and forwarded for identification, and our grateful thanks are due to the Imperial Bureaux of Entomology and Mycology, and to the Trustees of the British Museum for the valuable assistance rendered by their Directors and Staffs.

I have the honour to be,
Sir,
Your obedient servant,

E. HARGREAVES,
Entomologist.

PART V.

REPORT ON THE DIVISION OF INPECTION.

To the Director of Agriculture, Freetown.

2nd March, 1929.

Sir,

I have the honour to submit the report of the Division of Inspection for the year 1928.

2. The staff of the division consists of one European Inspector of Plants and Produce, one European Assistant Inspector, ten African Sub-Inspectors and one Junior Third Grade Clerk. The Assistant Inspector, Captain F. W. B. Allinson, arrived in the Colony on first appointment on 25th February and was placed in charge of inspection in the Southern Province with headquarters at Bonthe.

Tours of Inspection.

3. From the beginning of March to the end of May, the Inspector of Plants and Produce was engaged on reliability trials with two types of nut-cracking machines in the Sumbuya District of the Southern Province. During August he made a tour of inspection of the trade centres on the railway between Roruks and Makeni. In October he toured in the Central Province between Bo and Kailahun, and during December through the ginger producing areas of the province and reported on the prospects of the ginger crop for the season 1928–9.

Legislation.

4. Early in 1928 a new Ordinance was passed which consolidated all previous legislation with regard to produce for export and also made rules governing the quality of piassava intended for export. The regulations governing the quality of ginger intended for export were amended to allow the export of all ginger which is sufficiently free from weevils and mildew to be of marketable quality and provided for the grading of ginger which complied with the standard laid down as Grade A.

Produce Inspection.

5. *Palm Kernels.*—With the aid of the additional staff of an assistant inspector and six sub-inspectors it was possible to supervise a much larger area than has been possible in the past and that the efforts to improve the standard of palm kernels exported were successful is proved by the reports received by merchants from their principals in England and on the Continent. Higher percentages of oil contents were returned on shipments of palm kernels made from Freetown and Bonthe than during any previous year. The highest recorded being shipments from Freetown which produced 51·25 per cent. of oil. The average for the year being slightly above the basis of 49 per cent. The highest return of oil contents from Bonthe shipments was 49·75 per cent. and the average for the year 48·5 per cent. When taking into consideration the fact that 75 per cent. of the palm kernels exported from Bonthe were stored in "factories" on the upper reaches of the rivers throughout the whole of the dry season owing to the rivers only being navigable during the height of the rainy season, the average oil content is exceedingly good.

6. It is satisfactory to note, however, that these adverse transport conditions will be non-existent in the near future. In fact they are already disappearing in the Yonni-Pujehun area. Roads are being pushed through from these up river stations down to navigable ports of the river. This will facilitate the use of motor transport and do away with the necessity of long storage.

7. During the year under review 67,105 tons of palm kernels were exported, which is the largest quantity shipped in any one year from the Colony. From the table given in paragraph 8 below relating to the exports for the last ten years, it will be observed that there has been a steady development in the export of this produce during the last six years. The export for 1923 was in itself a record and there has been, since then, an average annual increase of 1,512 tons. This represents an increase of 7,560 tons in five years. This increase can without question be attributed to a great extent to the increased transport facilities and the gradual opening up of the Protectorate by motor-roads, and there is no reason to suppose that the Colony has yet reached the limit of its resources in this respect.

8. The following is a statement of the exports of palm kernels during the last ten years:—

Year.	Tons.	Value.
		£
1919	50,622	1,191,607
1920	50,425	1,401,676
1921	40,409	685,069
1922	49,029	722,403
1923	59,545	968,797
1924	61,117	1,096,386
1925	63,231	1,152,467
1926	65,000	1,116,780
1927	65,436	1,077,450
1928	67,105	1,150,649

The home market prices for palm kernels were steadier than in the previous year and never dropped below £20 per ton.

Piassava.—There has been a satisfactory development in this trade during the last two years, due chiefly to the firms established at Mano Salija and Sulima and also to the steady demand in the European markets, more especially for the better class fibre. There is still room for improvement, however, in the quality of the piassava exported although considerable improvement was effected during the year under review, through legislation and propaganda work, particularly in the Sherbro District. There is still a considerable difference in the prices paid in the same market for shipments of piassava from this Colony. Quakoh fibre may realize from £8 to £10 per ton more than Sulima or Sherbro ordinary qualities. This differenee is entirely due to the manner in which the fibre is prepared. The Quakoh method of preparation although being far from perfect, is much more thorough than that used in the preparation of either ordinary Sherbro or Sulima qualities. With a view to introducing an improved method

of preparation and thereby raising the standard of piassava, approval was obtained to employ two piassava instructors. One to operate in the piassava producing areas of the Southern Province and the other to endeavour to open up new areas in the Central Province. These instructors commenced work in June and carried on until the end of the year and their efforts have met with considerable success, particularly in the Central Province where the people showed a keen interest in the development of what is to them a new industry. In the Southern Province considerable difficulty was at first experienced owing to the lack of interest shown by the people. The higher prices offered by merchants for good quality, however, was sufficient in the end to convince them that it was more profitable to produce good quality. It was unfortunate however that, owing to the unprecedented floods which occurred in these areas during August and September, large quantities of piassava which were under course of preparation were washed away, resulting in a serious drop in the purchases during the remaining months of the year. It was put forward by merchants that this falling off of purchases of piassava in the Sherbro areas was due to the rigid enforcement of the Ordinance at Bonthe and that producers were transporting their piassava to Sulima and Mano Salija where it was said inspection was not so constant, there being no inspector permanently stationed at these stations. The export figures for the last four years from the Port of Bonthe show, however, that the 1928 exports were actually greater than the three previous years. The export figures are as follows :—

Year.	Tons.
1925	679
1926	633
1927	721
1928	751

The total export from the Colony for the year under review was 3,189 tons, being 771 tons more than was exported in 1927. Of this total over 1,683 tons were exported from Sulima and 755 tons from Mano Salija. The prices obtained locally average £12 per ton for ordinary quality, while firms have offered as high as £20 per ton for prime quality at Bonthe.

9. *Ginger.*—As already stated, the regulations regulating the quality of ginger for export were revised to allow the export of all ginger which was sufficiently free from weevils and mildew to be of marketable quality. This was done at the request of the members of the Chamber of Commerce. The price of ginger in the early part of the year was not sufficiently encouraging to justify this department insisting on ginger being peeled, and even when the price of ginger is high the difference in price offered for peeled ginger as against ordinary scraped ginger is not sufficient to compensate the producer for the time and labour expended. Our efforts were therefore directed towards the production of good Grade B quality, i.e. scraped ginger, thoroughly dry and sufficiently free from weevils to be of marketable quality. The 1928 ginger season was a very disappointing one from the growers point of view, the highest price paid to them being 3*d.* per lb. At the end of the season the market price was raised to 6*d.* per lb. in Freetown, but unfortunately the producers had already sold all their crop, and the only people who benefited were the intermediate traders who had held on to their stock in anticipation of a rise in price.

10. The exports of ginger from the Colony in 1928 amounted to 20,431 cwt. as against 27,354 cwt. in 1927.

Palm Oil.—The development which has taken place in the palm kernel trade of the Colony has unfortunately not extended to the palm oil industry. There was in fact a decrease in the export of this product as compared with 1927 of 1,084 tons—the 1928 exports being 2,525 tons while the exports for 1927 amounted to 3,609 tons. This decrease can undoubtedly be attributed to the unusually early rains which occurred in the Sherbro District causing the native to abandon the collection of palm fruit and attend to the working of their farms. The quality of the oil exported was a good standard and maintained a favourable position in the home market.

Prosecutions.

11. The number of people reported for offences against the Ordinance during the year was very much greater than in the previous year, and the fines inflicted were more than doubled. The following is a return showing the number of persons reported by the division and the fines inflicted during the year:—

Number reported	239
Number criminated	213
Number discharged	18
Number not dealt with at the end of the year ...	8

Total amount of fines inflicted £303.

Weights and Measures.

12. The verification and stamping of weights and measures was carried out in the Protectorate by the Inspector of Plants and Produce in conjunction with his other duties, whenever possible. During the year 383 certificates of justness were issued while the fees collected amounted to a total sum of £49 15*s.* 4*d.* No offences against this Ordinance were reported by the division during the year.

Palm-nut-cracking Machines.

13. In order to test the reliability of nut-cracking machines and to prove whether their introduction would be well received by the people, trials were conducted by the Inspector of Plants and Produce with two types of machines, namely the "Rapid" nut-cracker, manufactured by the Vegetable Oil Syndicate, Manchester, and the "Knox" nut-cracker, manufactured by Adam Knox and Sons of Glasgow. Four nut-cracking machines of each type, together with a "Rapid" separator, were supplied free of charge by the makers. The trials which extended over a period of thee months took place in the Sumbuya District of the Southern Province. The Knox type was proved to be the better and more efficient machine. It stood well up to the work and was much appreciated by the people. Several orders have since been placed with Messrs. African and Eastern Trade Corporation by chiefs and others in the Southern Province. The "Rapid" machine, although an efficient cracker, did not stand up to the work and was therefore not favoured by the people. The separator does not save any appreciable amount of labour and therefore attracted very little attention.

14. A report on these trials was submitted by the Inspector of Plants and Produce pointing out the faults found in the "Rapid" machine and giving suggestions for improvement in the construction. The improvements suggested have been executed and arrangements are being made to carry out further trials. It is hoped that by the adoption of efficient nut cracking machines the output of palm products will be increased.

15. In conclusion the writer desires to express his appreciation of the excellent manner in which the staff of the division have carried out their duties during the year.

GEO. TUACH,
Inspector of Plants and Produce.

PART VI.

REPORT OF THE DIVISION OF AGRICULTURE.

Section I.

28th March, 1929.

The Honourable the Commissioner of Lands and Forests.

Sir,

I have the honour to submit the following report on the Division of Agriculture for the year 1928.

Staff.

2. Mr. D. W. Scotland, Director of Agriculture, proceeded on leave on the 14th March and returned to the Colony on the 11th August. On the 3rd October he was appointed Acting Commissioner of Lands and Forests and Director of Agriculture.

Mr. J. W. D. Fisher, Provincial Superintendent of Agriculture, acted as Director of Agriculture from the 14th March to the 6th June when he proceeded on vacation leave. He returned to the Colony on the 3rd November when he took over the Southern Province.

Mr. R. R. Glanville, Provincial Superintendent of Agriculture, returned from vacation leave on the 28th February. He acted as Director of Agriculture from the 6th June to the 11th August when the Director of Agriculture returned from leave. He was in charge of the Northern Province for the rest of the period.

Mr. E. I. Nisbett, Provincial Superintendent of Agriculture, returned from leave on the 19th May and was in charge of the Experimental Farm, Njala, for the remainder of the year.

Mr. J. V. R. Brown proceeded on leave on the 21st November. He was in charge of the Central and Southern Provinces for various periods.

Mr. P. J. Moss, Provincial Superintendent of Agriculture, was in charge of the Northern Province, Njala Experimental Farm, and the Central Province, during various periods throughout the year.

Mr. D. C. Edwards, Agricultural Instructor, was on duty at Njala from the 28th January to the 31st October when he proceeded on vacation leave.

It is gratifying to note that my Provincial Superintendents of Agriculture kept good health, with the result that we were able to carry out a full progamme of work in the various provinces.

The African Agricultural Assistants were increased by ten further appointments on the 1st November. These appointments were all made from the successful Agricultural Apprentices in training under the Instructor.

African Agricultural Assistants W. D. Sannu, S. W. During and C. A. Tucker were successful in passing their promotion examination to Second Grade Agricultural Assistants from the 1st July.

Agricultural Development.

3. The year under review was a very busy one for the Provincial Superintendents of Agriculture and the native staff. Again, owing to the good health of the European staff, a full programme of work was carried out in each of the provinces and for very short periods during the year it was necessary for a Provincial Superintendent of Agriculture to supervise two provinces; this cannot be avoided under the present establishment of five Provincial Superintendents of Agriculture for four posts. It is very difficult to fit in the leaves of officers without the necessity of a Provincial Superintendent of Agriculture being in charge of two provinces.

There was undoubtedly marked agricultural progress during year. The appointment of ten new African agricultural assistants mentioned in paragraph 2 above are very welcome additions to my Provincial staff.

4. Our activities and propaganda work have been continued in connection with various crops. In the following paragraphs I will deal with the more important crops.

Cocoa.

5. In the Southern Province we have our main cocoa area. Plantations have been in existence for some years, but every assistance was given to people wishing to extend their plantations or to lay down new ones.

The following table shows the number of seedlings planted out during the year:—

Sumbuya District	...	...	...	9,724
Pujehun District	...	...	...	3,417
Mano River District	...	...	...	15,083

A staff of trained natives maintained a regular round of inspection of plantations and nurseries and also in the season demonstrations were given in the proper fermentation of the bean.

The Government Fermenting Station at Yonni was reopened for the second year. This was well advertised but only a total of 1,211½ lb. raw cocoa beans were received which yielded 494 lb. of fermented cocoa. Another fermenting station was started at Zimi in the Mano River District at the request of the people; the request came late in the season when the majority of planters had dealt with the cocoa crops; therefore only 141 lb. raw cocoa were received yielding 66 lb. fermented cocoa beans. The following cocoa diseases were reported for the first time:—

"Pink" disease in a town in the Barri Chiefdom and "White Thread" disease was found in the Nomo Chiefdom.

The cocoa exports from the province for 1928 were 71 tons.

6. We continued our work on cocoa in the Pendembu and Kenema districts of the Central Province. The following table will be of interest :—

District.	Number of Plantations.	Number of Trees Planted.	Area.
Kenema ...	39	9,539	49 acres
Pendembu ...	76	16,093	83 acres

The above figures only represent plantations made under my officers' direct supervision. The area planted privately is unknown.

As some of the older plantations are just coming into bearing, demonstrations in fermenting, were given and the owners of bearing trees assisted.

It is interesting to note that nearly 16 tons of cocoa were purchased in Kenema recently so the cocoa planters in the district are beginning to see some returns for their labours.

The cocoa areas in these districts are very limited and I doubt if there is room for very great extension. The conditions are more suited to coffee, so the would-be cocoa growers are being carefully advised by my officers on the suitability of localities for cocoa. There is no doubt that natives have privately planted cocoa in unsuitable localities and every effort is being taken to direct their energies along the right lines.

7. In the Northern Province the cocoa planting is being very carefully watched in the Koinadugu and Bombali districts. It is estimated that there are 16,000 seedlings in 114 plantations in these two districts. Since cocoa planting started in 1925 it is estimated that there has been a mortality of 35 per cent. seedlings in plantations. In 1928 about 12,500 seedlings were put out. Cocoa is doing well in the Koinadugu District and the south-east of the Bombali District. There is an increasing keenness amongst the natives who seem anxious to grow this crop. The policy is, however, not to extend the areas under cocoa until we see the results of the existing plantations.

Coco-nuts.

8. The coco-nut planting scheme in the Southern Province has progressed satisfactorily. Planting was carried out during the year as follows :—

District.	Number of Seedlings Planted.	Number of Seed-nuts placed in Nursery.
Pujehun	4,081	11,653
Sumbuya	5,448	8,606
Shebar and Sherbro ...	9,562	30,924
Totals ...	19,091	51,183

A number of young plantations were destroyed by the excessive flooding which occurred in September, but it is pleasing to record that on the whole the plantations are in a thriving state. The most successful continue to be those on Turner's Peninsula. The coco-nut scale (*Aspidiotus destructor*) has appeared in parts of Sumbuya and Pujehun districts and it appears probable that it will overrun the whole of the coco-nut country. It is, however, disappearing from the Shebar and Sherbro chiefdoms where it is now being controlled by its natural enemies.

As some of the earlier planted coco-nuts are coming into bearing, it was decided to carry out demonstrations in copra making. These were carried out at four centres with the following results :—

District.	Town.	Number of Nuts treated.	Weight of Copra obtained.
Shebar and Sherbro	Bendu ...	1,000	373 lb.
	Gbapp ...	1,321	464 lb.
Sumbuya ...	Massa ...	1,000	163 lb.
Pujehun ...	Mano Bonjema ...	1,000	270 lb.

Representatives from all the coco-nut producing chiefdoms attended the demonstrations and showed considerable interest. Messrs. African and Eastern Trade Corporation Limited have offered to buy this copra and have already bought two lots at a price equivalent to £18. to £19 per ton.

9. The natives in the Bullom area of the Northern Province asked for help in coco-nut planting. Most of the villages in Kafu Bullom and Lokko Massama chiefdoms have a number of palms growing in their vicinity. The palms thrive especially near the coast. A start was made by establishing a nursery at Urika in the Lokko Massama Chiefdom with a view to raising seedlings for planting out along the shore between Urika and Balo Point. It is hoped this will be the beginning of intensive planting in the littoral areas of the Port Loko District.

10. The Colony scheme for the encouragement of coco-nut planting has been continued. Plantations laid down at Kent, Tumbu and Mammah Beach have been maintained and nurseries started at Adonkia and Goderich.

Coffee.

11. In the Southern Province the natives are very keen on coffee planting; there are a fair number of coffee trees in the Mano River and Pujehun districts, therefore the natives know the crop. We have assisted planters in procuring seed and starting nurseries.

The following table shows the progress made during the year :—

District.	Variety.	Number of Plantation.	Number of Seedlings planted.	Number of Nurseries made.
Gbangbama ...	Robusta ...	27	4,877	73
Mano River ...	Liberica ...	2	316	34
Pujehun ...	Liberica ...	26	2,073	3

Large number of seedlings were distributed from Pujehun Demonstration Farm to various persons in the district.

12. A start has been made in the Central Province. It has been decided to grow the following varieties in the various districts :—

Coffea stenophylla—in the Kono, Panguma, Pendembu and Kenema districts.

Coffea canephora—in the Moyamba District.

Coffea liberica—south of the railway in the Kenema District.

At the end of the year large quantities of seed were distributed in the districts. The seed came from the plantations at the Experimental Farm, Njala. The nurseries at Bedu and Moyamba have large numbers of seedlings available for distribution in 1929.

13. *Coffee Plantation, Moyamba.*—Work at Moyamba was carried out on the same lines as in 1927; contour planting with contour strips of bush between blocks of coffee.

Good progress was made by the 1927 seedlings, while the area was extended by opening new blocks along the road to Yoyema. The nursery was maintained in good condition and was an excellent example of such work. Twenty-one and a-half acres have now been planted as follows :—

1927	...	...	...	9 acres (approximately)
1928	...	...	...	12½ acres (approximately)

There is a very large stock of seedlings in the nurseries. Various cover crops were sown or planted, among them being pigeon pea, *Calopogonium*, sweet potatoes and velvet beans. These cover crops have saved soil-wash considerably.

14. In the Northern Province there is an increasing interest shown in this crop and it is hoped to lay down a considerable number of nurseries durig 1929. In this province the areas suitable to certain varieties of coffee have been mapped out. The varieties of coffee being used are *robusta*, *canephora* and *stenophylla*. During 1928 about a dozen nurseries were made and small plantations were laid down at the following places :—

Mamaka and Mamunu in the Bombali District, and Mabonto and Bendugu in the Koinadugu District.

Kola.

15. Kola nuts form a very prominent export of Sierra Leone. As explained in previous reports it is an important crop with the natives and found growing in and around every town and village in the country. The Agricultural officers spend a large amount of time while on trek advising the people in pruning and care of the trees. Recent experiments have proved that the productivity and health of the trees are vastly improved by the usual cultural and sanitary methods of plantations. My officers have a considerable amount of difficulty in getting owners of kola trees to carry out any advice, they are very loth to "interfere" with this tree as it is connected with the very life and superstition of the people. However, as the natives advance, I hope more care and attention will be given to this plant and our advice followed.

16. The kola plantations laid down in 1927 in twenty-seven chiefdoms of the Koinadugu District have been kept under constant observation and the owners advised as to their upkeep. The majority of seedlings have grown very well although there were some failures Nuseries are being made to supply these failures.

Oil-palm.

17. In the Southern Province requests were received from a large number of paramount chiefs for oil-palm plantations. Nurseries have been established as under :—

Mano River District	...	...	...	55
Sumbuya District	...	...	...	10

When furthur supplies of seed of the thin-shelled type of Nigerian palm are available many more nurseries will be made.

There are three demonstration plots of wild palms in this province. The purpose of these plots is for studying and demonstrating the improvement of the oil-palm areas which may be effected by judicious thinning, planting and tending.

In the Central Province only nursery work in raising seedlings has been carried out. There has been a big demand for tested varieties of seed, but unfortunately the supply is limited from Njala.

An area has been selected near Boadjibu in the Panguma District to carry out a complex enquiry designed to show the comparative effect of the clearing of the undergrowth on tall, medium and short palms. Recording had not begun at the end of the year, but the various plots have been demarcated and cleaned. The site was very well chosen by the Provincial Superintendent of Agriculture and we expect both interesting and useful data from these plots.

In the Northern Province a scheme was started in 1927 to encourage chiefs and other natives to lay down model palm plantations. This work has been continued and during the year under review fourteen plantations and sixty-two nurseries were made. The total area of the fourteen plots was thirty-three acres. It is hoped to plant four times this area in 1929 Unfortunately sufficient seed has not been available from the plantations at Njala to supply the demands in this province, otherwise a considerably larger area would have been planted. The Njala supply of selected seed has been sent to the Masanki Palm Plantation where stock for several hundred acres is required within the next two years.

SWAMP RICE.

Southern Province.

18. *Lake Mabesse Trials.*—There are extensive areas of suitable swamp land around the lake after the fall of the water towards the end of the year. The natives use this land to a very small extent and very frequently lose their crops owing to the behaviour of the water at the beginning of the rains. From observations it has been proved that the most suitable time to sow the seed in the nursery is late November and transplanting can generally be undertaken towards the end of December or early in January. The floods were abnormal this year and in addition to damaging the crop the water remained unduly long over the mud flats bordering the lake. Transplanting in 1929 will therefore be later than usual.

The Indo-China Variety.—Small plots of this rice were planted in the month of March with the object of observing its behaviour when grown in the swamp in which the water rises to a considerable height. In August the water in these plots was 18 feet deep and the plants were standing above water level. During September the water became deeper and this, combined with squalls on the lake, uprooted the plants. Many of these plants drifted into more sheltered situations, took root and gave a small return. Two plots were tried in the

ordinary sheltered riverine swamp and yielded satisfactory returns. In these places the variety has proved of interest to the natives. Further work with this variety, which shows considerable promise, is being undertaken.

The Ceylon and Rangoon Varieties.—These included Rangoon rice, HK—13, Dahanahal Hinati—H d—15, Kuruppu Hinati—H o—33, and Illankalayan—I b—16. Each was tried both broadcasted and transplanted. Trials under the former method were failures and the transplanted plots yielded very poor returns. They appear to be early maturing varieties and suffered through being kept over long in the nursery while the water was subsiding. The variety H d—15 was an exception, this variety yielded elevenfold.

The Skarcies Varieties, Pa Kunko, Pa Saygbama, Pa D. C. and Pa Litoma. These trials were unfortunately spoilt owing to poor quality of the seed obtained from Kambia in the Northern Province. The variety, Pa D. C. was better than the others and gave a small return.

Demonstration Plots at Cassada Island (Dibia) and in Mano River District. These trials evoked no interest and a continual difficulty was experienced in obtaining labour to conduct them so they have been concluded.

Jong River Trials.—The methods are now well understood in this area and instructional work has ceased.

Central Province.

19. The 1927-1928 crop was harvested in December, 1927 and January, 1928. The yields were satisfactory. It will be remembered that in 1927 our propoganda, which had hitherto been confined to the Pendembu District, was extended to the Panguma, Kenema and Kono districts. It is gratifying to record that the yields in the latter districts were such that the people at once showed a keen interest in the crop.

The following table gives the average yield for each district :—

District.	Total Bushels sown.	Total Bushels harvested.	Average Yield per Bushel sown.
Pendembu ...	101·0	4,856·5	48·1
Kono	11·15	347·0	31·0
Panguma ...	10·0	592·5	59·25
Kenema	10·5	377·5	35·95
Total Central Province	132·65	6,173·5	43·59

The yields per farm varied from extraordinarily good to very bad, but in most cases where the yield was bad damage had been done either to the nursery or to the growing crop. There is no doubt that a farmer is justified in expecting at least fifty bushels per bushel sown, given ordinary care and freedom from damage by animals.

The 1928–1929 Crop.—A further extension of propaganda took place in 1928, the Moyamba District being included, so that the work is now carried on all over the province.

The table below shows the number of farms planted in each district in 1928 : —

District.	Number of Farms.		Bushels sown.	
	1927.	1928.	1927.	1928.
Pendembu ...	62	84	101	163
Kono	15	11	11·5	25
Panguma	6	29	10·0	50
Moyamba	—	7	—	8
Kenema	20	28	10·5	36
Total Central Province	103	159	133	282

It will thus be seen that, while the number of farms increased by 50 per cent. the number of bushels sown increased by over 100 per cent. The farms are therefore larger—an indication that previous growers think they are on a good thing. Given the same average yield as for the

1927–1928 crop, the total harvest for the province should be over 13,000 bushels. Taking the ratio of paddy to clean rice as 1 : 2, 3,000 bushels of clean rice were given in 1927–1928, and about 6,500 bushels should be produced in 1928–1929. Taking 7*s*. as the average price per bushel for cleaned swamp rice in the Central Province in 1927–1928 the value was over £1,000 while in 1928 it should be about £2,200.

I wish to emphasize that these figures refer only to farms cultivated under the supervision of the Provincial Superintendent and his native Agricultural officers. There is in addition a large number of "private farms" cultivated by the people in imitation of the "Government" farms. Most of these are in the Pendembu District, the Provincial Superintendent of Agriculture has a list of 200, though this is very incomplete.

Northern Province.

20. The propaganda begun in the previous year was continued. The following number of farms were planted in the proper transplantation manner :—

District.	Chiefdoms.	Plantations.
Bombali	9	37
Karene	10	24
Koinadugu	9	10

The above figures only relate to plots made under Government supervision.

In the Bombali District a special effort was made to encourage rice cultivation in the thickly populated areas of the Biriwa and Safroka chiefdoms. Fifty bushels of rice (Pa Litoma) were brought from the Skarcies for farmers who had insufficient seed of their own. In the Kunike chiefdoms some of the plots were damaged by wild animals, and the excessive floods in September caused considerable damage to several plots in the low lying farms in the Pampana valley. Otherwise results were quite satisfactory.

The Karene District results have been encouraging. In addition to the plots made under Government supervision, there was an increased number of farms made by persons. acting independently. The transplanting method has a very wide following in this district In the Koinadugu District the transplanting method was introduced for the first time in the following chiefdoms:—Morifindugu, Negeia, Saradugu and Sengbe. Further farms were made in those chiefdoms in which experiments had been carried out in 1927. All the plots are well reported on, and there is no doubt that Government assistance and propaganda are producing excellent results.

Raffia.

21. This fibre is extracted from the young leaves of the *Raphia vinifera* palms which grow wild in the Protectorate. In the Northern Province this department gave active assistance in the recent effort to encourage the production of raffia fibre. For a short time the Provincial Superintendent of Agriculture purchased fibre at Makump. The firms at Magburaka then became interested and started purchasing for themselves. About 25 tons of raffia were purchased before the close of the year.

Baling was carried out by the Provincial Superintendent of Agriculture on behalf of various firms. Some seventy bales of 200lb. each were turned out. It appears that raffiia production would have a bright future in this country provided the best quality only is purchased and exported. Owing to inferior quality being shipped it has been decided to bring this fibre under strict inspection and grading before exportation is allowed.

Ploughing.

22. As ploughing with cattle has been successfully introduced into French Guinea, we were of opinion that the conditions in the Northern Province of Sierra Leone are sufficiently similar to warrant the belief that ploughing will also prove successful in this country. In April Mr. R. R. Glanville, Provincial Superintendent of Agriculture, Northern Province, visited French Guinea with a view to obtaining first hand information on the subject and also for making arrangements in connection with the Sierra Leone pupils whom he had taken with him to learn ploughing at the Government Farm at Kankan. Mr. R. R. Glanville submitted an interesting and useful report on his visit and enquiries. The three pupils were established at Kankan; they spent six months in training and have now a sound practical knowledge of the work. On their return in November, one of the pupils was detailed for work at the Experimental Farm at Njala. Of the other two, one is working at Batkanu in the Karene District and the other is at Karina in the Bombali District. The cattle-owning chiefs and farmers are genuinely interested in this new scheme, and we have great confidence that the plough has come to stay.

23. I wish again to record my appreciation of the manner in which my Provincial Superintendents of Agriculture, together with their subordinate staff, have done their work during the year under review. It is entirely due to their enthusiasm, energy and tact that we have had a year of marked agricultural progress. I wish also to thank the Political Officers for their help and interest in the agricultural progress of the country under their administration.

Experimental, Demonstration and other Farms.

24. Experimental Farm, Njala.—The main experimental station is situated at Njala, which is 8 miles by motor-road from Mano Railway Station — 106 miles from Freetown. This station is in charge of a Provincial Superintendent of Agriculture, and has been the headquarters of the Director of Agriculture since January, 1912, but in view of reorganizing the Lands and Forests Department into two separate departments, Forestry and Agriculture, the Director of Agriculture left Njala on the 18th October, 1928, to act as Commessioner of Lands and Forests and Director of Agriculture in Freetown and to reorganize the department into two separate departments.

Permanent Plantations.

25. *Dominica Limes (Plot 1).* Planted in 1916. The trees were planted 15 feet x 15 feet. The manurial trials detailed in the previous report were altered to the following :—

Section 1.	Potash	37·0 oz.	per tree.
	Sulphate of Ammonia.	9·3 oz.	
	Superphosphate.	27·8 oz.	
Section 2.	Potash	37·0 oz.	per tree.
	Sulphate of Ammonia.	9·3 oz.	
Section 3.	No manure.		

In the early part of the year part of each section had the trees thinned by having every other tree cut out. The monthly yields in bushels per 100 trees from each section were : —

Month.	Section I.		Section II.		Section III.	
	a.	*b.*	*a.*	*b.*	*a.*	*b.*
April	7·00	3·06	5·20	8·00	7·00	10·37
May	0·00	0·00	0·00	0·00	0·00	00·00
June	3·00	2·55	1·04	0·50	3·00	6·79
July	28·00	10·20	12·00	4·50	16·00	1·86
August	118·00	76·53	9·72	19·00	5·00	31·38
September	67·00	78·57	34·37	33·00	26·00	40·15
October	164·00	193·87	115·62	160·00	143·00	115·15
November	180·00	300·00	133·33	183·50	176·00	182·97
December	68·00	97·95	58·33	65·50	79·00	58·24
Total	635·00	762·73	369·61	474·00	455·00	446·91

a. Thinned section. *b.* Unthinned section.

It would hardly be fair to compare the results from the thinned and unthinned sections as the thinning was only carried out at the beginning of the year. Future yields will indicate whether the thinning will benefit the plantation. The order of productivity of each matured section remains the same as last year.

Cinnamon, Avocado years and Plums (Plot 2).—This plot was planted up in August with one row of Satsuma plums and one row of Burbank plums imported from England in 1927. These plants were first acclimatised in the nursery before going out on to the plot. Simmond's avocado pear seeds were received from California in February, 1927, seedlings were raised in the nursery and planted out in August 1928. The plants at present are showing poor progress.

Stenophylla Coffee (Plot 3).—Planted in 1916. In 1927 a new form of manurial trials was started as described in the 1927 report. The yields from the sections of this plot were as follows :—

Section I.	Section II.	Section III.
Complete manure	Nitrogen and phosphate ...	Control
363 lb. 4 oz. ...	474 lb. 0 oz.	541 lb. 3 oz.

The above yields are in "Cherries" per 50 trees. Section I which has previously given the heaviest yield this year has given the least. Part of Section II used to be in section I under the previous trial scheme. None of the trees in Section III have ever received any artificial manure.

The balance of bushes on the plot not included in the trial have yielded 206 lbs 3 oz fresh cherries, that is from 141 bushes, but many of these are very small and some have been damaged from "witch broom."

Kola (*Plot 4*). Planted in 1916. There are 116 trees on the plantation, including twelve small ones not bearing.

The yields have been :—

Date.	Number of Pods.	Weight of Pods.	Weight of Nuts.	No. of Trees Fruiting.
December, 1927	225	86 lb. 8 oz.	29 lb. 1 oz.	20
July, 1928	158	28 lb. 1 oz.	9 lb. 8 oz.	22
December, 1928	1,081	311 lb. 2 oz.	106 lb. 8 oz.	63

Fifty-three trees bore red and pink nuts and ten trees bore red, white and pink nuts.

Orchard and Aboretum (*Plot 6*). The grape fruit, tangerines and lemons have given a fair crop. Three rows of avocado pears have been planted out. Twenty-seven grafted trees of commercial varieties purchased and imported from Florida in November, 1927 were planted out from the Njala nursery, and eight trees received from the United States Department of Agriculture, also from Florida, were planted out on arrival in October, 1928. The twenty-seven trees from the nursery have not established themselves at all well.

Citrus Fruit Orchard (*Plot 15*). This plot is in very good condition and the young trees, are doing well. Eighty-three more young trees have been planted out, fifty-four grape fruit twenty-two orange and seven lemon.

No damage was done by locusts during the past year. Their breeding places were found and destroyed by the Entomologist.

Hydnocarpus Anthelmintica (*Plot 21*). 280 seedlings have been planted out and the trees are growing well.

Canary Bananas (*Plots 38A*).—Planted in 1927. I regret to report serious damage by excessive floods in September, 1928.

Canephora Coffee (*Plot 57*).—For the first time manurial trials were carried out on this plot. The 1927 crop which was harvested in early 1928 yielded from the whole plot 914 lb. fresh cherries. During 1928, for the manurial trials, 150 plants were selected on this plot and divided into three sections of fifty trees each. The yield of fresh cherries from each section was as follows :—

Section I.		Section II.		Section III.
Complete manure	...	Potash of phosphate	...	Control
577 lb.	...	411 lb.	...	350 lb. 9 oz.

The yield from the balance of bushes not included in the above trial was 640 lb. 3 oz. fresh cherries.

The quantities of manures were applied at the following rates :—

Potash	0·34 lb.	per tree.
Sulphate of ammonia	0·34 lb.	
Super-phosphate	0·17 lb.	

Sierra Leone Limes, North Farm.—Planted in 1914. This plot gave a yield of 448¼ bushels limes during the last six months of the year. The whole of the plot was flooded to a depth of 4 to 5 feet during September by an abnormal rise of the Taia River, a large quantity of lime fruits were washed away and lost, the total yield was therefore more than shown.

Kola, North Farm.—Planted in 1913. The yield during the past year has been:—

Date.	Number of Pods.	Weight of Pods.	Weight of Nuts.	Number of Trees bearing.
November, 1927	2,413	877 lb. 10 oz.	361 lb. 8 oz.	47
December, 1927 to Jan., 1928	1,473	523 „ 1 „	196 „ 8 „	30
June, 1928	2,470	542 „ 8 „	212 „ 15 „	70
December, 1928	2,399	339 „ 8 „	232 „ 5 „	113

For the last two harvests records of the number of trees bearing each colour of nut are available. Red nuts were borne by seven trees, white nuts one tree, red, white and pink nuts by twenty-eight trees, pink nuts by two trees and red and pink nuts by seventy-five trees.

There is nothing of outstanding importance to report on the other permanent plantations.

Annual Crop Trials.

26. *Cotton Trials (Plot 7a).*—The exceptionally heavy rain in August of 38·63 inches and a further 17·38 inches in September were disastrous for the cotton plots. Growth was checked and the plants succumbed to the attack of aphidæ.

Manurial Trials on Ginger (Ginger Plot 9a).—The crop that was planted in 1927 was harvested in February, 1928. The yields were as follows :—

Manure.	Section	Yield in lb. per Acre.
N. P. K. and lime ...	15	1665
„	17	3885
N. P. K.	1	1460
„	8	1585
N. P. and lime	2	1710
„	9	2765
N. P.	11	3345
„	18	2055
N. K. and lime	4	3480
„	6	1650
N. K.	13	2315
„	20	4310
P. K. and lime	12	3640
„	19	3590
P. K.	3	5750
„	10	1500
Control with lime	7	2105
„	14	—
Control	5	5125
	16	2460

N=Sulphate of ammonia at the rate of 2 cwt per acre
P=Superphosphate at the rate of 2 cwt. per acre
K=Sulphate of potash at the rate of 2 cwt. per acre
Lime was applied at the rate of 2 tons per acre

The above experiment was repeated in 1928 on the same land with the same manures. The yields were poor, as follows :—

Manure.	Section.	Yield in Lb. per Acre.
N. P. K. and lime	15	430
,, ...	17	290
N. P. K.	1	660
,, ...	8	370
N. P. and lime	2	180
,, ...	9	220
N. P.	11	480
,, ...	18	290
N. K. and lime	4	1,500
,, ...	6	520
N. K.	13	550
,, ...	20	480
P. K. and lime	12	580
,, ...	19	320
P. K.	3	910
,, ...	10	750
Control with lime	7	200
,, ...	14	320
Control	5	1,650
,, ...	16	790

In addition to the artificial manures the plots received a dressing of 10 tons per acre of "pitstuff" (decayed organic matter). This organic manure was not applied in 1927.

The falling off in yield in the 1928 crop was chiefly due to the diseased condition of the crop about August to September. We had abnormally heavy rainfall at that time The crop gradually began to show diseased conditions and died down. The cause is not definitely known.

Rice (*Plot 9c*).—The results of the manurial tests were :—

Manure.	Section.	Yield in Lb. per Acre.	
		Lb.	Oz.
N. P. K. and lime	15	176	14
,, ...	17	486	4
N. P. K.	1	659	6
,, ...	8	515	10
N P and Lime	2	942	8
,, ...	9	285	10
N. P.	11	585	10
,, ...	18	548	2
N. K. and lime	4	439	6
,, ...	6	331	14
N. K.	13	688	12
,, ...	20	238	2
P. K. and lime	12	831	4
,, ...	19	423	10
P. K.	3	744	6
,, ...	10	104	6
Control with lime	7	543	12
,, ...	14	306	14
Control	5	76	4
,, ...	16	461	4

N=Sulphate of ammonia at the rate of 2 cwt per acre.
P=Superphosphate at the rate of 2 cwt per acre.
K=Sulphate of potash at the rate of 2 cwt per acre.
Lime was applied at the rate of 2 tons per acre.

The yields from these plots were very poor. The 1928 manurial trials were repeated on the same plot and sections as carried the same manurial trials in 1927. The lowest yield in 1927 was 840 lb. per acre, and the highest was 1,280 lb. per acre. Manuring had by no means benefited the crop, in fact unmanured native upland farms give on an average better yields than the Njala manured plots did in 1928. The crop was apparently healthy.

27. There was a large variety of other crops under trial. I have only brought out some of the more important features of the work on the Experimental Farm.

28. *Nursery.*—The nursesy at Njala supplied a large quantity of economic plants to various applicants. As my Division is the only source of supply for such plants in Sierra Leone, the nurseries at Njala take up a large amount of time of the officer in charge there. Stocks have been well maintained for distribution.

29. The abnormally heavy rainfall in August caused the Taia River to flood. The river has never been known to be so high. Considerable portions of the farm were under water. Fortunately, no very serious damage was done to permanent plantations, but there is no doubt that many annual crops suffered seriously owing to water-logging of the soil.

30. The Experimental Farm and Station were kept in good order. As Njala is purely an agricultural station the maintenance of roads, buildings, sanitation, etc., is under the supervision of the Provincial Superintendent of Agriculture.

Makump Experimental Farm.

31. Two further buildings of pisé with corrugated iron roofs have been built and part of the farm has been fenced. The farm has been further extended by clearing 8 acres of land.

32. The following crops are under trial :—

Plot 1. Cocoa.—This plot consists mostly of cocoa believed to be about twenty years old. These trees were originally planted by the Soudan Mission. There was a good crop of pods which were all utilized for laying down nurseries in the cocoa areas.

Plot 2. Liberian Coffee.—This young plot is making excellent progress. *Cassia* is being used as shade and *Calopogonium muconoides* as a cover crop.

Plot 3. Calopogonium muconoides.—This is grown for seed purposes.

Plot 4. Kola.—The crop is grown under natural shade and the progress is moderate.

Plot 5. Kawei Oil-palm.—This is a plot of natural stand of palms. The plot is kept clean and a record is kept of yields. The yield from this plot has been as follows :—

1927	...	...	...	...	94 heads of fruit
1928	...	...	...	...	127 „ „ „

There are forty palms on an area of $\frac{3}{4}$ acre.

Plot 6. Stenophylla Coffee.—The progress of this plot has been disappointing.

Plot 7. Nigerian Oil-palm.—This is a new plot of 1 acre. One-year old palms were planted out 30 feet by 30 feet. Progress has been excellent. The following cover crops were tried : *Calopogonium muconoides*, Bengal Beans *Crotalaria*, "Fundi" and sweet potatoes. This cover crop experiment has not been concluded. All the crops covered the ground satisfactorily, but Calopogonium was found to be the best for the purpose and for checking growth of weeds.

Plot 8. Robusta Coffee.—A new plot of $\frac{1}{2}$ acre. Guinea Negro bananas have been planted as temporary shade and *cassia* will provide the permanent shade. The progress is satisfactory.

Plot 9. Canephora Coffee.—A new plot of $\frac{1}{2}$ acre The Canary banana forms temporary shade on this plot. Progress satisfactory.

The nursery was kept in good order and has been well stocked. From this nursery were distributed 9,463 seedlings.

Bedu Demonstration Farm.

33. This farm is being supervised by the department for the benefit of the people of the Luawa Chiefdom. Demonstration plots of permanent crops have been laid down.

The plots now consist of Coffee Canephora, Coffee Stenophylla, Nigerian oil-palms, Henoi oil palms and Kola. A cocoa plot was started two years ago at the request of the Paramount Chief but as it proved a failure it has been cut out.

The new plots laid down were Henoi oil palms, 400 plants, and Nigerian oil palms, 69 plants

34. This farm in future years will form a very useful demonstration to the people of. that area.

Kainkordu Farm (Kono District).

35. This farm was also started at the request of the Paramount Chief and Tribal rulers as a demonstration for the people of the chiefdom. The farm was handed over to Paramount Chief Foya on the 2nd March, but my agricultural officers constantly visit the farm to advise the Chief. The farm consists of permanent plots of coffee canephora, kola, and cocoa. The plots were in very good condition during the year.

Pujehun Demonstration Farm.

36. The programme of work for this farm was as follows :—

Annual Crops.—The three years rotation course started in 1927 was continued with rice, yams and ground-nuts with the following results in 1928 :—

Plot 1. Rice.—Yielded 12½ bushels husk rice per acre.

Plot 2. Chinese yams.—Yielded 6,474½ lb. tubers per acre.

Plot 3. Ground-nuts.—Yielded 155½ lb. dry unshelled nuts per acre. Organic manure is applied to the root crop (yams) in the form of pit-stuff buried in the ridges. That is the only form of manure applied in the rotation.

Permanent Plots.

Plot 4. Cocoa.—Planted in 1927. There have been a number of failures. A quarter of this plot was flooded in September owing to the abnormal flooding of a stream adjoining the farm.

Plot 5. Liberica Coffee.—Planted in 1927. The plants are thriving.

Plot 6. Kola.—Planted in 1927. The plants are not doing too well although being constantly attended to for insect and fungus attacks.

Plot 7. Coffee Robusta.—Planted in 1927. This plot is very promising.

Nursery.—A large nursery was maintained to supply the requirements of the districts in the Southern Province near Pujehun.

Zimi Model Farm.

37. This is a small farm at Zimi, the Political headquarters of the Mano River District of the Southern Province. There are plots of Cocoa and kola and soil fertility trials were carried out in rice when a new area of secondary bush was cleared and sown with rice. The crop yielded twenty-five and a-half bushels husk rice per acre. The same plot will be deep-hoed and planted to rice without any manure beyond that derived from the rice stubble and weeds that will be turned into the soil. A small nursery is maintained at this station.

Scheme of Agricultural Training for the Sierra Leone Battalion, Royal West African Frontier Force.

38. This scheme was initiated in 1927 and it is described in the report for that year. It is unfortunate that the programme of work for permanent plantations was not carried out, this no doubt was due to the change of headquarters of the Battalion from Daru to their new barracks at Wilberforce.

The swamp rice planting was carried out and the area considerably extended. The yield was extraordinarly low. This matter has been investigated and it is difficult to account for. Certain areas which showed "yellowing" in 1927 again suffered.

The Platoon plots were maintained so far as labour supply allowed. Chinese yams, maize and pigeon-peas were grown on these plots.

Owing to the reduction of the Force at Daru the scheme is being revised with the approval of the Commanding Officer.

A teacher trained in agriculture has been stationed at Daru and the Provincial Superintendent of Agriculture has inspected the farm periodically throughout the year to advise and assist in the scheme.

39. *Agricultural Survey of the Protectorate.*—During the year under review my agricultural officers have collected a large amount of data to complete the surveys of each chiefdom in their provinces. Such a survey naturally takes time but when complete it will be invaluable.

Agricultural Instruction.

40. As Agricultural training forms such an important part in the progress of agriculture, I attach as Appendix C the Agricultural Instructor's Report for the year under review.

41. Mr. D. C. Edwards is to be congratulated not only on his successful year of training (we were fortunate in having ten apprentices pass out as Agricultural Assistants) but also on the most interesting and useful work on the selection of the local quande cotton, on rotation of crops, pasture grasses and cultural operations. The results of these experiments, carried out by the apprentices on their farm, will increase our knowledge of local agriculture. It is highly important to continue Mr. Edwards' work and bring it to a successful conclusion.

42. The standard of agricultural training has been maintained and there is no doubt that some of the pupils attain a high standard, judging from the excellent papers submitted in the final examination of the session. The selection of candidates by a board has resulted in a very good first year group.

43. I am hoping for good results from the selection work on the local variety of quande cotton. A steady improvement has been obtained in the lint of this cotton since the work started in 1925.

44. The palatability trials on pasture grasses are both interesting and useful. A full report on this work was submitted by Mr. Edwards.

45. The cultural operations and folding of sheep on rice are particularly interesting. It must be remembered the land on which these trials have been made has been cropped annually for four to five years. The fertility of these plots has been very well maintained, especially as the soil can produce crops of rice yielding 1,800 to 2,000 lb. per acre. This is equivalent to forty-five to fifty bushels of husk (paddy) rice per acre.

Agricultural Crops.

46. *Rice.*—The 1928 crop as a whole is an average one. In some districts the upland farms burnt badly owing to early rains and the anxiety of farmers, because of such early rains, burning their bush farms prematurely. Also the excessive rain in August caused heavy flooding in several fertile valleys with the result that many rice farms were destroyed.

47. Serious damage was caused on the low lands adjoining the Rokelle and Pampana rivers. There has however been a marked increase in the cultivation of swamp rice on inland swamps both in the Northern and Centra Provinces. A certain amount of damage was done to the extensive swamp rice areas on the deltas of the Great and Small Skarcies rivers, but in spite of this average crops are expected from these productive rice fields. 372 tons of rice were exported valued at £5,027. The price of rice at the end of 1928 was exceptionally high, it varied at up-country stations from 8*s.* to 12*s.* per 84 lb. The cause of the rise is not easily accountable, it is probably due to the expected shortage in certain districts and there is no doubt that the native growers are holding some of their produce for a rise in price.

48. *Kola.*—During 1928 there was a fall in the quantity of kola exported as compared with 1927. The actual difference being about 1,162 tons. The quantity exported was however kola more than in 1926. There was a drop in export in spite of the fact that the average price of in 1928 was about £25 per ton more than in 1927. There is no doubt that the kola crop was very much smaller than the previous year. There appear to be two causes for this, one was the prolonged and marked harmattan which caused a shedding of blossoms in the early part of the year followed by the usual destruction by strong tornados, and I am informed the heavy rains at the end of the season did not benefit this crop.

49. *Cocoa.*—Eighty-four tons of cocoa were exported valued at £3,176. There was an increase of seven tons over 1927.

50. *Ginger.*—The price offered to the native grower was so low that the farmers in many cases never bothered to harvest their crops. Only 20,431 cwt. valued at £30,582 were exported. This is about 7,000 cwt. less than in 1927 and more than 60 per cent. less than in 1926.

51. *Pepper or Chillies.*—One hundred and five tons were exported valued at £10,554. There was more than three times as much shipped than in 1927. The natives have increased its cultivation coniderably owing to the favourable price offered during the last two years.

52. *Piassava.*—There is a marked increase in the export of this natural product. In 1928, 3,289 tons valued at £40,369 were exported, as compared with 2,418 tons in 1927. The average export value was about £12 to £13 per ton both years.

53. *Palm Kernels.*—There was an increase of 1,669 tons exported in 1928 over 1927. The 1928 figure was 6,7105 tons valued at £1,150,649.

54. *Palm Oil.*—There is a marked decrease in the export of this commodity compared with 1927, being 1,084 tons. In 1928, 2,525 tons were exported valued at £66,445.

55. 1928 has been an average farming year. In some districts good agricultural crops were harvested but in other parts farmers suffered owing to early rains preventing the proper burning of their farms and also owing to abnormal floods caused by the exceptionally heavy rainfall in August, when considrable damage was done to farms and property. There was, however, a marked increase in the trade of natural products as piassava and palm kernels and for the first time raffia fibre will appear as a commercial export fibre.

56. Appendices.—A Rainfall Data 1928.
B Meteorological Data 1928.
C Annual Report of the Agricultural Instructor for 1928

I have the honour to be,

Sir,

Your obedient servant,

DOUGLAS. W. SCOTLAND,
Director of Agriculture.

Agricultural Department,
Freetown, Sierra Leone.

Appendices.

A—RAINFALL DATA, 1928.

Month.	Batkanu.	Bo.	Bonthe.	Daru.	Hill Station.	Kabala	Kanyma.	Kissy	Makeni.	Moyamba.	Njala.	Pu'eluu.
January	·31	1·12	·96	1·10	2·54	·35	1·20	1·19	2·31	·76	3·60	·70
February	...	...	...	·41	...	...	...	...	...	...	...	·30
March	1·23	3·51	·99	3·63	5·81	2·15	2·95	·92	5·12	2·51	2·54	2·16
April	5 56	9·21	6·60	7·94	2·63	9·17	9·27	1·43	6·38	9·27	9·12	4·80
May	15·71	11·80	14·32	14·76	10·59	6·63	4·63	8·96	14·10	14·89	11·47	9·56
June	12·99	13·46	23·96	14·94	13·33	7·26	12·18	12·09	22·70	13·55	16·13	17·18
July	18·13	20·39	35·12	10·78	43·76	19·55	11·81	29·35	25·56	18·38	18·36	35·88
August	25·35	33·19	34·97	16·84	49·07	14·41	17·26	31·99	19·21	33·50	38·63	35·24
September	17·46	24·52	31·50	16·09	35·17	15·74	24·16	26·93	23·79	27·16	17·39	23·61
October	11·14	12·81	12·85	12·99	21·22	20·78	17·13	11·73	15·72	14·30	16·62	13·45
November	5·27	4·16	6·12	7·79	3·76	2·12	3·59	3·17	8·27	4·15	5·24	5·19
December	·08	·19	3·18	3·27	3·76	·66	1·35	1·42	4·11	1·90	·40	1·43
Total	113·23	135·32	170·87	110·51	191·64	98·82	106·13	132·18	147·27	140·37	139·50	149·71

B—METEOROLOGICAL DATA FOR NJALA, 1928.

Month.	Shade.		Total Rainfall for Month.
	Maximum.	Minimum.	
January	97·26	66·94	3·60
February	101·79	65·59	...
March	98·74	66·52	2·54
April	89·93	70	9·12
May	86·97	68·35	11·47
June	86·57	70·13	16·13
July	84·52	71·39	18·36
August	81·45	71·06	38·63
September	85·47	71·97	17·39
October	89·94	70·58	16·62
November	91·2	69·7	5·21
December	90·53	68·03	0·40

C—AGRICULTURAL INSTRUCTOR'S REPORT.

Agicultural Department,
Njala, *via* Mano,
Sierra Leone,
11th February, 1929.

THE DIRECTOR OF AGRICULTURE, SIERRA LEONE.

SIR,

I have the honour to submit my annual report for 1928.

STAFF.

2. The staff under me in this section of the Agricultural Department consists of—

1 Laboratory assistant.
1 Laboratory boy.
1 Sergeant Drill Instructor.

NUMBER OF APPRENTICES IN TRAINING.

3. The number of apprentices in training at the beginning of the year was twenty. One of these (Apprentice D. C. Bright) proved unsatisfactory, and his apprenticeship was terminated in August. At the end of the year eleven apprentices sat for their final examination for promotion to Agricultural Assistants, and ten were successful. These were drafted to various parts of the Protectorate to take up their duties under the Provincial Superintendents of Agriculture.

WORK COVERED.

4. The scheme of work undertaken was, in the main, the same as that carried out in 1927, there were however some alterations and additions. Less attention was devoted to live-stock for the reasons explained in my 1927 report, *viz.* that practically all the apprentices have a very slight acquantance with farm animals, and the facilities for practical work are not here. More practice, than previously, was obtained in drafting reports on various sections of the practical work.

THEORETICAL WORK.

5. As previously, this consisted of three main branches, agriculture, agricultural chemistry, and agricultural botany. The two last are intended to cover the elementary science necessary to a comprehensive study of agriculture, and in the case of the first year apprentices this has always entailed commencing with first principles.

PRACTICAL WORK.

6. The theoretical work was supported in every way possible by practical demonstrations in the laboratory and in the field, and the instruction was kept closely in touch with work on the Model Farm and the main farm. With a view to preparing them to assist in similar work in the provinces, the apprentices were given every encouragement to take interest in the experiments being carried out on their farm, and a number of them gave valuable assistance. Each apprentice is required to cultivate a quarter of an acre of land under rotations that are being tested.

7. A trek through the Southern Province constituted an important part of the practical training for the third year apprentices. Eleven apprentices under the Agricultural Instructor undertook this trek in July. The journey was arranged so that the most important cocoa, coffee, piassava, and coco-nut areas were visited. Very considerable areas of each of these crops were inspected, and observations made on the spot, and instruction given to the apprentices. Each apprentice submitted a report on each crop, compiled from his own observations.

SESSIONAL EXAMINATION.

8. The examination was held in October. Papers were set in the three branches of the work, and an additional practical examination in agriculture was held. A number of questions in each paper were set by external examiners, and an external examiner also assisted in the practical test. This examination constituted the final test for the third year apprentices, and as already mentioned, ten out of the eleven who sat, qualified as Agricultural Assistants. One apprentice failed to obtained a pass in each of the other groups, first year group (four apprentices), and second year (four apprentices).

New Appointments.

9. Four new appointments were made at the beginning of the year. In the past it had been remarked that the method of selection of candidates for appointment as apprentices was not satisfactory (*see* paragraph 15 of annual report for 1926), and as a result, a selection board was set up and functioned for the first time this year. The more thorough examination of the candidates resulted in what is probably the most promising first year group handled up to the present.

Physical Training and Games.

10. The course of physical training and drill was continued and has had a marked beneficial effect.

11. The sports club was maintained successfully by the apprentices, and at the end of the year the treasurer showed a substantial balance in hand. A keen interest in games was shown throughout.

Short Course for Teachers of Education Department.

12. During June a short course was arranged for some of the teachers of the Education Department who were undergoing a course of instruction at Njala School. The course consisted of elementary talks and demonstrations under the following heads :—

(1) Sources of plant food. A simple study of the atmosphere and the soil.

(2) How plants feed and their food. A brief survey of plant nutrition.

(3) How we can help plants to obtain their food. Cultural operations, manuring, rotation of crops, etc.

13. Few, if any of these teachers, showed any grounding in elementary science or nature study, and it is doubtful whether such a short course could be expected to produce any useful results, although a number of the teachers showed a keen interest.

Senior School Boys of Njala School.

14. Four of these boys who were considered to have attained a sufficient standard of education, attended the course given to the agricultural apprentices, three the first year course and one the second.

Model Farm.

15. The apprentices' model farm consists of an area of $9\frac{1}{2}$ acres of which five acres are divided into $\frac{1}{4}$ acre plots under the care of individual apprentices. The remainder is devoted to various experimental plots. The farm was kept in good condition throughout the year, and the apprentices took a keen interest in the work. Some of the more important experiments undertaken were as follows :—

16. *Quande Cotton.*—The selection of native cotton for greater length and better colour of lint has been in progress since early 1925. A steady improvement has been obtained, and the results have been confirmed by reports kindly furnished by the British Cotton Growing Association on samples supplied from time to time. During the year an attempt was made to increase some of the improved cotton to obtain information on its behaviour when sown in bulk. Unfortunately an exceptional flood destroyed some of the plots, and seriously damaged others. The selection plot which was also flooded, withstood the conditions well, and was not seriously damaged. This year it is hoped to increase a number of improved strains.

17. *Rotations of Crops.*—A number of rotations are being tested on the $\frac{3}{4}$ acre plots worked by individual apprentices. Some of the schemes appear to be proving successful, but comparative results are not yet available as no records of the yields for 1924 exist.

18. *Pasture Grasses.*—In response to a call for information on possible pasture grasses in connection with a proposed development of the live-stock of the country, experiments were carried out on the palatablility of a number of common grasses.

19. In this work sheep were used, and observations were first made to ascertain the grasses and other plants on which the animals fed. Experiments were then carried out to determine the relative palatability of these grasses and other plants.

20. It was found that the sheep fed chiefly on eleven different grasses and a number of other plants, at the particular time of year when the experiments were carried out (August and September). The most palatable grasses were found to be as follows :—

Axonopus compressus
Melinis minutiflora
Rottbœllia exaltata
Setaria sulcata
Pennisetum gracile

Certain other plants, e.g. *Commelina sp.* ("Kpagoi", in Mende) proved to be palatable and may be found useful.

21. Provision has been made to continue these experiments. Further palatability tests will be carried out at different times of the year, and investigations will be continued to ascertain the suitability of the various grasses for forming pastures.

22. *Cultural Operations.*—Various cultural operations have been tested. Two of considerable interest carried out during the year were rolling of young rice in the early stage of growth and folding of sheep on young rice. The figures obtained for these are given below, but owing to lack of sufficient labour it was not found possible to plan the experiment in a way in which the significance of the results could be readily ascertained. The figures appear to be some indication that the rice has benefitted from both operations, and it will be noted that an increase in tillering has been obtained.

In the folding experiment the sheep ate the young rice very readily, and from the results it can, at least, be concluded that sheep can be fed on this crop without causing damage.

ROLLING OF YOUNG RICE.

Plot.	Date Sown.	Date Rolled.	Average Number of Fruiting Heads per Plant.	Yield per 1/16 acre in lb.	Yield per acre in lb.	Remarks.
15B—rolled ...	3 5 28	19 5 28	6	48	768	Damaged by flood.
unrolled ...	,,	,,	4·2	35	560	
14A—rolled ...	4 5 28	29 5 28	5·9	34	544	Damaged by flood.
unrolled ...	,,	,,	4·1	22	352	
4A—rolled ...	,,	26 5 28	7	100	1,600	
unrolled ...	,,	,,	4·7	80½	1,288	
5A—rolled ...	,,	28 5 28	6·3	120	1,920	
unrolled ...	,,	,,	4·7	96¼	1,540	
10B—rolled ...	5 5 28	22 5 28	4·6	48	768	Badly weeded.
unrolled ...	,,	,,	3·1	27	432	
5B—rolled ...	7 5 28	28 5 28	5	113	1,808	
unrolled ...	,,	,,	4·5	107½	1,720	
10A—rolled ...	,,	26 5 28	5·3	69	1,104	Shower after sowing.
unrolled ...	,,	,,	4·7	64¼	1 028	
12B—rolled ...	,,	30 5 28	5·5	92½	1,480	Shower 4 days after sowing.
unrolled ...	,,	,,	4·1	76	1,216	
11B—rolled ...	10 5 28	27 5 28	4·5	111	1,776	
unrolled ...	,,	,,	4·2	78	1,248	
8A—rolled ...	11 5 28	28 5 28	5·1	45	720	Poor germ : badly weeded.
unrolled ...	,,	,,	5·6	46	736	
12A—rolled ...	,,	30 5 28	6·7	122½	1,960	
unrolled ...	,,	,,	6·5	116½	1,864	
1B—rolled ...	12 5 28	28 5 28	8·9	58	928	Attacked by rats.
unrolled ..	,,	,,	8·8	54	864	
11A—rolled ...	15 5 28	,,	5·4	89	1,424	Shower after sowing.
unrolled ...	,,	,,	4	81	1,296	

Rate of seed sown ... 2 lb. per 1/16 acre. Soil ... Sandy loam.

SHEEP FOLDING ON RICE.

Plot.	Date Sown.	Date Grazed.	Date Harvested.	Average Number of Fruiting Heads per Plant.	Average Weight of Husk Rice per Plant.	Yield in lb. per 1/40 Acre.	Yield in lb. per Acre.	Remarks.
1	10 5 28	9 6 28	2 10 28	8·8	1·38	53	2,120	Thinned by gazing — edge of plots exposed to light
1A	10 5 28	—	4 10 28	4·8	·5	50	2,000	
2	14 5 28	18 6 28	6 10 28	6·7	·63	50	2,000	Rain after sowing
2A	14 5 28	—	9 10 28	5·9	·57	46	1,840	
3	18 5 28	19 6 28	11 10 28	7·2	·62	50½	2,020	Thin. Poor germ — Rain after sowing
3A	18 5 28	—	13 10 28	9·4	.65	47	1,880	
4	22 5 28	23 6 28	15 10 28	5·0	·40	48	1,920	Some vacant spaces
4A	22 5 28	—	16 10 28	4·2	·35	42	1,680	
5	26 5 28	27 6 28	17 10 28	8·4	·95	46	1,840	Some vacant spaces — edge of plots next bush about 4 yds. distant
5A	26 5 28	—	18 10 28	6·5	·40	38	1,520	

Rate of seed sown ... 1½ lb. per 1/40 acre.
Plots 1A, 2A, 3A, 4A, and 5A ungrazed.
Plots 1, 2, 3, 4, and 5 grazed.
Soil ... Sandy loam.

23. *Leguminous Crops for Green Manure.*—During the year Sword Bean (*Canavalia ensiformis*) was introduced to the Model Farm from the Gold Coast. This crop had not been previously tried. It produced a very good stand, and forms an excellent cover for the ground throughout the rains. It possesses an advantage over Bengal beans in that it does not climb, which quality is apt to make the latter troublesome in permanent plantations. Also sword beans are edible, which may prove an inducement to their cultivation in any rotations which may be introduced (during fruiting they retain heavy foliage).

24. *Sheep.*—A flock of sheep has been started for demonstration in selection and improvement. In April, 1928, the number was ten, and has since increased to sixteen at the date of writing. In December a ram was killed by a leopard. A careful record of the flock is kept.

I have the honour to be,

Sir,

Your obedient servant,

D. C. EDWARDS,
Agricultural Instructor.

Njala.

PART VII.

REPORT ON THE DIVISION OF FORESTS.

19th February, 1929.

The Director of Agriculture, Freetown.

Sir,

I have the honour to submit the annual report on the Division of Forests of the Lands and Forests Department for 1928.

Staff.

2. The Conservator of Forests acted as Commisioner of Lands and Forests from the beginning of the year until he proceeded to England on sick leave on the 3rd of October. He had not returned by the end of the year. The division was in charge of the writer from 1st to 31st January, and from 23rd June, to the end of the year: and of Mr. D. G. Thomas from 1st February to 22nd June. In addition the writer was in charge of the Newton

Experimental Fruit Farm from the time when work there was begun in August until the end of the year, and Mr. D. G. Thomas was in charge of the Mabang Palm Plantation throughout the year, except for the period spent on local leave (14th November to 30th December). Mr. A. Burns was in charge of the Southern Circle from the beginning of the year until 4th September, and of the Eastern Circle from the beginning of the year until 24th September. He proceeded to England on leave on the 3rd October. Mr. McIntosh arrived in the Colony on first appointment on 4th July. He took over the Southern Circle from Mr. Burns on 4th September and the Eastern Circle on 24th September, and he remained in charge of those circles until the end of the year. The Northern and Western Circles were in effective charge of African rangers throughout the year, subject to such supervision as could be given by Mr. Thomas and myself.

3. It will be seen that there were two forests officers present in the Colony and engaged on forestry from 4th July to 3rd October, and that during the remainder of the year only one forest officer was available for forestry.

4. *Proposed New Reserves.*—Formal requests have been obtained for the following areas;—

(*a*)

Prior to 1928.	Chiefdom.	District.	Province.
Namba and Kissi mountains	Luawa	Pendembu	Central
	Kissi Kama	,,	,,
	Kissi Teng	,,	,,
	Kissi Tungi	,,	,,
"Little Gory"	Pejeh West	,,	,,

The request for this area was obtained on 1st May, 1925, and it was originally to be included in the Gory Hills Reserve, but at the time of demarcation it could not be included in that reserve.

(*b*)

During 1928.	Chiefdom.	District.	Province.
Togbine hills ...	Mando on 10/2/28	Pendembu	Central
Lehei hills ...	Jawi 31/1/28	,,	,,
,,	Pejeh West on 19/9/28	,,	,,

5. *Demarcation and Constitution.*—The Singama Ridge Reserve in the Kowa Chiefdom Moyamba District, Central Province, was demarcated by Mr. Burns between 26th January and 13th February at a cost of £76 19*s.* 6*d.* It consists of a narrow strip of forest running along the crest of the ridge in a north-westerly direction from the Tibei River to near the sight of the old town of Kowama. The area is 690 acres.

The Reserve Settlement Court was held at Jama in the Kowa Chiefdom, Moyamba District, on the 18th July and the reserve was finally constituted by Governor's Order No. 19 of 1928 (*Gazette* No. 2499 of 22nd September, 1928).

Gory Hills proposed Reserve.—Mr. Burns continued the demarcation of this reserve in March and completed it on the 23rd June. The boundary was cut within the chiefdoms of Fiama and Penguia in Kono District and Yawei in Panguma District during that period, the chiefdoms of Bane and Sowa having been completed previously. The total area is 33·07 square miles and the external boundary 60.83 miles. During 1928 the sum of £241 19*s.* 6*d.* was spent on the demarcation.

The map of the proposed reserve and report were submitted by Mr. Burns, but the date of the Reserve Settlement Court will not be fixed until he returns from leave. The demarcation of the proposed Gola North Reserve was not completed, but Mr. McIntosh inspected the portions of the boundary of the proposed Gola North Reserve already demarcated in Goura and Malema chiefdoms, and interviewed the chiefs and "big men" concerned. An agreement was come to with the Gowra people as regards the line of the boundary where it was left off, eastward to Malema Chiefdom, excluding the Towubu farmed bush. In Malema, however, no agreement was come to and the settlement of the boundary has been referred to the Reserve Settlement Court which has still to meet. The Reserve Settlement Court for the Tama Reserve was held

on 17th August, and the Reserve was constituted by Order 22 of 1928 dated 18th October, 1928. The list of reserves and restricted areas now constituted is as follows :—

RESERVES.	Square Miles.	RESTRICTED AREAS.	Square Miles.
Colony :			
Colonial	73·39		
Leicester Peak	·23		
Protectorate :			
Kesewe Hills	9·01	Bompe River	30
Kambui Hills	56·00	Ribi River	12
Nimini North	48·50	Yoni East	1
Nimini South	10·03	Yoni West	1
Dodo Hills	8·40		
Gobo Hills	4·46	Kohlifa Mabang	1
Kagnari Hills	33·10	Senehun West	8
Moyamba Hill	·73	Bafi and Sewa River ...	20
Bojene Hills	2·85		
South Kambui	3·36		
Gboi	·79		
Gola Forest (West) ...	24·03		
Gola Forest (East) ...	88·16		
Tonkoli Reserve	184·00		
Malal West Reserve ...	1·31		
Tama Reserve	66·00		
Singamba	1·07		
Total	615·42 square miles	Total ...	73 square miles.

Total protected forest area 688·42 square miles. 2·5 per cent. of the area of the country (27,250 square miles.)

6. *Exploitation.*—One hundred and twenty seven trees were felled on licence in the Colony Reserve. Of these 122 were for making fishing canoes.

7. The gum copal tapped in 1927 was harvested; the total export being 42 tons valued at £3,999.

8. *Nurseries and Plantations.*—No new plantations were made, but nurseries were maintained to supply plants for beating up existing plantations and to gain experience. Some 10,000 seedlings of indigenous species are available for planting out in 1929.

9. The exotics planted in the Kambui Reserve have not proved satisfactory. Indigenous trees have been much more successful. Mr. McIntosh reports as foilows :—

> "The most successful trees tried in plantations has been Yawei (*Heritiera sp.*). It does not take badly to exposure, and the laterite gravel so common in this country. Hendui (*Lophira procera*) has not yet been tried out in plantation, but from the progress of single trees planted in Kenema and of natural regeneration it would seem an easy species to raise in plantation, and possesses great vitality. Gum copal has done well when shaded, but takes less kindly to the open. Semei has done badly so far. It has suffered greatly from browsing by game and such trees as survive are very badly shaped. Kpendei has also proved as difficult as Semei. With all these species the shade requirement when young requires a great deal of investigation. In the natural conditions of evergreen high forest, seedlings are accustomed to dense shade and attempts to grow them in the open hardly provide optimum conditions. An encouraging feature displayed by Semei is its coppicing power and it is probably worth trying to take advantage of this by cutting back misshapen plants and trusting to have them replaced by vigorous coppice shoots."

10. The Eucalyptus plantation in the Gola East Reserve has proved a failure, its trees having been practically wiped out by termites. The area has been replanted with indigenous trees (*Heritieria* and *Entandophragma*), which are making satisfactory progress.

11. A series of interesting experiments on the germination of Teak were carried out by Mr. Burns (assisted later by Mr. McIntosh) in connexion with the attempt to establish this species in Sierra Leone. The best germination obtained was 52 per cent. The seedlings raised have been lined out in nursery beds and will be planted out when ready.

12. The tapping of the Kenema Rubber Plantation was continued.

13. Although the Mabang Palm Plantation and the Experimental Fruit Farm were under the control of forest officers, they reported direct to you. For this reason, and because these undertakings are outside the scope of forestry, I make no mention of them in this report.

I have the honour to be,

SIR,

Your obedient servant,

ERIC MACDONALD,
Acting Conservator of Forests.

D. W. SCOTLAND, ESQUIRE,
DIRECTOR OF AGRICULTURE,
FREETOWN.